BELLSOUTH REPLY COMMENTS

CC Docket No. 01-338

July 17, 2002

ATTACHMENT 3

REPLY DECLARATION OF PROFESSOR ROBERT G. HARRIS

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I. QUALIFICATIONS AND SUMMARY

1. I, Robert G. Harris, am Professor Emeritus at the Walter A. Haas School of Business, University of California, Berkeley and a Director at LECG, the law and economics consulting group. I earned Bachelor of Arts and Master of Arts degrees in Social Science from Michigan State University and Master of Arts and Doctor of Philosophy degrees in Economics from the University of California, Berkeley. At Berkeley, I taught undergraduate, MBA and doctoral courses in managerial economics; business and public policy; industry analysis; competitive strategy; and telecommunications economics, policy and strategy. In addition, I have conducted original academic research on antitrust, regulation, telecommunications, and transportation on competition and regulatory policy, technological innovation, competitive strategy, telecommunications and transportation, which has been published in more than 50 articles in academic journals of business, economics, law, management and public policy.

2. I have testified before Congress, state legislatures, the Federal Communications Commission, Interstate Commerce Commission, Department of Justice, Canadian Radio-TV Commission, the Secretariat of Communications and Transportation of Mexico, 27 state regulatory commissions and numerous State and Federal Courts on competition, interconnection pricing and costing, intellectual property and other public policy matters. As the Deputy Director of the Interstate Commerce Commission, I played an instrumental role in the implementation of Congressional Acts deregulating the railroad and motor carrier industries. I have also been a consultant to numerous government agencies,

including the Office of Technology Assessment, California and U.S. Departments of Justice, California Department of Consumer Affairs, U.S. Department of Transportation, U.S. General Accounting Office, and the Economic Planning Agency of Japan on regulatory and competition policy in the telecommunications and transportation industries. I served on the California Governor's Task Force on Telecommunications Infrastructure. My curriculum vita is Attachment 1.

3. BellSouth Corporation requested LECG to conduct a business case analysis of Regional Bell Operating Company (RBOC) investment in infrastructure improvements to enable the delivery of broadband access via digital subscriber line (DSL) technology over their telephone networks. The purpose of that analysis, which is presented in Attachment 2 to this declaration, was to assess the financial returns for DSL investments and the sensitivity of those returns to possible changes in market penetration and regulatory requirements. This declaration will draw upon, and refer to, the results of that analysis, which found that, assuming "baseline" conditions and expectations, RBOCs' investment in DSL network upgrades will not turn cash flow positive until 2004, with an accumulated $7 billion in negative cash flow. Only after six years of positive cash flow will the RBOCs have recovered their DSL investment. The business case analysis also shows that DSL investment returns are subject to enormous market and technology risks. If, for example, RBOCs achieve a 25% lower market penetration (compared to the baseline case), they would realize $1.2 billion less in cash flow, threatening the financial viability of those investments. RBOCs' DSL investments are also subject to extraordinary regulatory risk: if, for example, this Commission were to impose unbundled network element platform (UNE-P) pricing of DSL service, cash flow would be reduced by $2.5 billion through 2011, making further investments in expanding the availability of DSL a losing proposition.

4. In addition to the DSL business case analysis, the purpose of this declaration is to reply to the comments filed by several parties in the initial round of this proceeding as they relate to broadband services, as well as certain issues raised by Dr. Vinton Cerf, Senior Vice President at WorldCom, in a letter to FCC Chairman Powell and Department of Commerce Secretary Donald Evans. This declaration also addresses a recent report by the Organisation for Economic Co-operation and Development (OECD) regarding public policies of broadband access. Finally, I will also comment on recent related decisions by the U.S. Supreme Court and the D.C. Circuit Court of Appeals.

5. The competitors' comments in this proceeding are voluminous, but there is nothing in them that would surprise anyone familiar with the long history of regulation, namely, the "the private use of the public interest." Though they offer many different arguments in support of their positions, competitors of the RBOCs seem to agree that more regulation of the RBOCs is better. There is no doubt that continued – much less heightened – regulation of DSL services and RBOC networks serves the private interests of their competitors. But there is also no doubt about what would serve the public interest. The road to more and faster broadband access, enhanced facilities-based competition and increased investment in telecommunications infrastructure is paved with incentives for investment and innovation – NOT with regulation.

6. In Section II, I will show that the markets for broadband access are competitive and becoming more so. The RBOCs do not have market power in those markets, so there is no need to regulate, nor are there public benefits from regulating their services in those markets, but there are enormous costs of doing so. In Section III, I will explain why, given the substantial differences across OECD countries in cable penetration and ownership, the recent OECD Broadband Report has limited applicability in the United States, where cable

networks are well-developed and cable modem service dominates the broadband access market. Section IV will demonstrate how asymmetric regulation of the RBOCs' DSL services is contrary to promoting broadband investment and facilities-based competition and why further regulation will cause far greater harm. By reducing its regulation of DSL, this Commission could unleash the full potential of market incentives, technological innovation, and facilities-based intermodal competition to accelerate the deployment of broadband access and the adoption of broadband services.

7. In Section V, I explain why the Supreme Court's recent decision regarding total element long run incremental cost (TELRIC) and unbundled network elements (UNE) combinations should have no bearing on – and certainly does not require – the unbundling of broadband services of DSL facilities. While the decision finds that the FCC acted within the bounds of the Telecommunications Act of 1996 in establishing the TELRIC costing methodology and UNE combinations, the decision says nothing about whether their implementation is good policy – which they are not, especially in the case of DSL. I will also comment on the decision by the D.C. Circuit Court to remand to the FCC the issue of unbundling requirements, which is based upon an excellent understanding of the economic effects of excessive investment. In addition to its legal reasoning, the decision provides sound guidance to the Commission on unbundling policy that will achieve the objectives of the Telecommunications Act by promoting investment and competition in broadband access services.

II. THE LACK OF MARKET POWER IN BROADBAND ACCESS

8. Competitors argue that RBOCs have market power in the provision of broadband services.[1] Using national market share data as a proxy for local geographic markets, it is evident that the RBOCs do not have market power in the market for broadband access.[2] Moreover, given rapid technological change, intermodal competition in broadband access will surely increase, both because the number of competing modes will increase and because the availability and capabilities of those competing modes will increase. One analyst estimates that about 10% of American households (10.85 million households, by the end of 2001) use broadband access to the Internet and other networks (e.g., enterprise LANs for work-at-home). Of those with broadband access, 58% are using cable modem, 37% are using DSL, and 5% are using another technology (wireless, satellite, or optical – fiber to the home). Penetration rates are expected to increase rapidly, to 37%, or 41 million households by 2005, with market shares of 53% cable modem, 35% DSL, 9% satellite and 3% optical.[3] Table 1 shows other estimates of broadband access penetration and modal shares.

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[1] In the Matter of Review of Regulatory Requirements for Incumbent LEC Broadband Telecommunications Services, CC Docket No. 01-337, *See* Comments of AT&T Corp., pages 19-20 and 36-37, and Comments of WorldCom, Inc., pages 20-25.

[2] While broadband service offerings and the degree of intermodal competition are not homogeneous across all local markets, there is a sufficiently high degree of similarity to use national or regional data as a reasonable first order approximation of market shares. Unlike the banking industry or the surface freight transport industry, the degree of variation in actual and potential market presence is not high enough to require or even justify an inquiry into each and every local market.

[3] "Optical Access, Part II," CIBC World Markets, October 23, 2001, page 9. (Hereinafter "CIBC.")

Table 1: Estimates of U.S. Broadband Access Penetration Rates and Modal Shares

Investment Firm	Broadband Subscribers, 2000	Broadband Subscribers, 2005
BMO Nesbitt Burns[4]	Cable modem: 70% DSL: 30% Other: excluded	Cable modem: 63% DSL: 37% Other: excluded
Jefferies & Company[5]	Cable modem: 61% DSL: 37% Other: 2%	Cable modem: 47% DSL: 44% Other: 9%
Salomon Smith Barney[6]	Cable modem: 71% DSL: 29% Other: 0%	Cable modem: 59% DSL: 34% Other: 7%
Lehman Brothers[7]	Cable modem: 67% DSL: 33% Other: excluded	Cable modem: 64% DSL: 36% Other: excluded

9. AT&T and WorldCom, through their comments and Dr. Cerf's letter, argue that "there is no reason to assume that there is now effective *inter*modal competition or that such competition will develop soon" because broadband service over cable networks is not available everywhere.[8] That is a backward-looking view of competition.[9] Cable companies

4 "Residential High Speed Internet Access," BMO Nesbitt Burns, October 15, 2001, pages 13-14.

5 "DSL Equipment Industry Report, Broadband Access – When will the DSL Equipment Market Recover?" Jefferies & Company, Inc., September 2001, pages 25-26.

6 "Telecommunications Services, The Battle for the High-Speed Data Subscriber: Cable vs. DSL," Salomon Smith Barney, August 20, 2001, page 1 and page 7.

7 "Consumer Broadband – Cable vs. DSL Chapter 2," Cable Communications Services, Lehman Brothers, page 7.

8 In the Matter of Review of the Section 251 Unbundling Obligations of Incumbent Local Exchange Carriers, CC Docket No. 01-338, *See* Comments of AT&T Corp., pages 93-94; Comments of WorldCom, pages 42-43. (Hereinafter "Unbundling Comments of …") *See also* Letter from Dr. Vinton G. Cerf to Department of Commerce Secretary Donald Evans and Chairman Michael Powell, May 20, 2002. (Hereinafter "Cerf Letter.")

are rapidly upgrading their networks to provide broadband services to reach more of the mass market. As of year-end 2001, cable networks passed over 90 percent of households in the United States.[10] The FCC reports that by the end of 2001, cable modem service was available to 70 percent of homes.[11] Industry analysts predict that by the end of 2004, 92 percent of homes will have cable modem service available.[12]

10. Dr. Cerf wrongly asserts that cable companies do not serve the business market. In fact, cable companies are actively marketing broadband access services to business customers today. AT&T Broadband, AOL Time Warner, Comcast, and Cox all have broadband offerings for business customers that focus on the distinct communications needs of businesses.[13] Moreover, not surprisingly, cable operators are rapidly extending their networks to reach even more business customers. It is not difficult to extend cable networks to reach many business customers; cable networks are nearly ubiquitous in residential areas, and many business customers are located near residential areas. An example of the adjacency of residential and business areas is shown in the zoning map of Orange County, Florida in

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[9] The Commission should note a familiar pattern of argument by RBOC competitors: when arguing for lower TELRIC prices, they stress that costs should be "forward-looking"; when arguing about competition, they typically refer to "the way we were."

[10] U.S. Census Bureau "Table DP-1. Profile of General Demographic Characteristics for the United States: 2000," and NCTA Industry Statistics (downloaded at www.ncta.com/industry_overview/indStat.cfm, 3/26/02).

[11] Third Report, *In the Matter of Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable And Timely Fashion, and Possible Steps To Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996*, FCC 02-33, CC Docket 98-146, February 6, 2002, page 22.

[12] Remarks to NARUC Telecommunications Committee by Robert Sachs, President and CEO, National Cable & Telecommunications Association, "Putting Broadband to Work for Consumers," July 17, 2001, referencing projections by Morgan Stanley.

[13] See AT&T Broadband's Web site (downloaded at www.bbs.att.com/static/index_flash.shtml, 3/19/02); AOL Time Warner's Roadrunner Web site (downloaded at rrcorp.central.rr.com/busclass, 3/19/02); Comcast's Web site (downloaded at www.comcastbusiness.com, 6/6/02) and Cox Business Services' Web site (downloaded at www.coxbusiness.com/systems/fl_pensacolaftw/internet.asp, 3/19/02).

Attachment 3. As one can see – and as is often the case – residential zones are interwoven with areas zoned for business, making it a simple matter to extend cable networks initially designed to serve residential customers into adjacent business locations. A recent interview with Chuck McElroy, Vice President and General Manager of Cox Business Systems, explains the business case for extending the company's network to business customers.

> As it turns out, the cable plant is not as hard to extend to business areas as commonly thought. Cox fiber already passes by many commercial zones, particularly as central businesses have in recent years migrated into suburban areas. And then there are a growing number of small and home-based businesses within Cox's residential network reach.
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> "In many cases we're already connected to commercial locations," McElroy says. "We pass by a lot of strip centers and a lot of industrial complexes. Then what we do is we enhance that network by building fiber hubs out to industrial parks and to large buildings and large business locations as well. So it is kind of a combination of leveraging and enhancing the existing network that is out there today."
>
> The upshot is that "incrementally we can get into the commercial market without throwing a lot more investment into the network," McElroy adds.[14]

11. Projections of business customer use of broadband cable services show continued strong growth. One analyst projects that in North America, cable modem services to businesses will grow by 69% per year to over 9.5 million connections in 2007.[15] As AT&T Broadband is the largest cable network operator, with large networks in major metropolitan

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[14] "Cox Unit Bucks Cable Image With Enterprise Offerings," Broadbandweek.com, August 6, 2001 (downloaded at www.broadbandweek.com/news/010806/010806_cable_cox.htm, 3/19/02).

[15] "Broadband Access, DSL vs. Cable Modems, 2002-2007," The Insight Research Corporation, March 2002, page 87.

areas around the country, it is well positioned to compete for many businesses over its cable networks.[16]

12. In addition to cable modem services, DSL will face increasing competition in the mass market for broadband access from satellite, mobile wireless (e.g., 2.5G-3G, WiFi) and stationary wireless (LMDS, MMDS). Several recent announcements indicate that wireless broadband access is already in the early stages of deployment in the United States. In January 2002, Verizon announced plans to roll out 3G service, with data speeds up to 150 kbps, to major markets throughout the U.S., and Sprint PCS showcased its 3G service and reiterated its commitment for a nationwide launch by mid-2002.[17] This is a major step in the progression toward mobile wireless broadband, which is projected to grow rapidly over the next several years. One estimate is that data revenue will double each year for the next four years, reaching $12 billion in 2006.[18]

13. Satellite communications service providers now offer Internet access (e.g., DirecPC), and pending network upgrades will substantially improve the quality of broadband satellite access and services. Hughes Network Services plans to provide services in North America with the launch of its SPACEWAY system in 2002, with global coverage available

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[16] "About the Industry: Cable Operators," National Cable & Telecommunications Association (downloaded at www.ncta.com/industry_overview/ top50mso.cfm, 3/26/02). *See also* "AT&T Broadband Benefits: Overview," AT&T Broadband Web site (downloaded at www.attbroadband.com, 6/25/02).

[17] "Announces Relationship With Accenture; Introduces Kyocera 2235 and the Sierra Wireless Aircard 555," Verizon Press Release, January 28, 2002 (downloaded at www.verizon.com, 3/26/02); "Sprint Showcases First Live Public Demonstration of its Wireless Third Generation Network," Sprint PCS Press Release, January 8, 2002 (downloaded at www.sprintpcs.com, 4/17/02).

[18] "According to a New Global Forecast from the Yankee Group, Wireless Subscriber Numbers Will Exceed 200 Million in the United States by 2006," Yankee Group News Release, May 7, 2002 (downloaded at www.yankeegroup.com, 6/6/02).

by 2003 or 2004, while Astrolink plans to initiate service in early 2003.[19] Both systems will operate in the Ka-band, which will deliver broadband services at substantially lower cost than the current Ku-band offerings.[20] Industry analysts believe that "satellite offerings should become increasingly visible over the next 12-18 months, at first competing effectively in markets underserved by cable and xDSL and, over time, as part of a bundled video offer with strong appeal for certain customer segments."[21]

14. Dr. Cerf's letter, as well as the comments of AT&T and WorldCom, brush aside intermodal competition from satellite and fixed wireless, stating that: (a) they do not provide the same level of reliability as DSL and cable modem; (b) they are not available everywhere; and (c) their equipment is more expensive than that of DSL and cable modem.[22] This view of intermodal competition is fundamentally wrong, because it fails to comprehend (1) the nature of intermodal competition and (2) the dynamic potential of intermodal competition.

15. For intermodal competition to be effective, it need not be true that each mode compete equally in all segments of the market, a point that has been well demonstrated in surface freight transportation. In some geographic markets, for example, railroads face substantial competition from inland barges; for some commodities, railroads face significant

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[19] Astrolink is owned by Liberty Media, Lockheed Martin Global Telecommunications, TELESPAZIO and TRW Inc.; "Broadband from Outer Space – A New Generation of Satellites Aims to Attack the Local Loop Market," Network Magazine, January 1, 2002; Astrolink Web site (downloaded at www.astrolink.com, 6/6/02).

[20] "Residential Broadband: Cable Modems, DSL, and Fixed Wireless," The Strategis Group, 2002, pages 116-117.

[21] "Broadband 2001," JPMorgan H&Q, McKinsey, April 2, 2001, page 7.

[22] Unbundling Comments of AT&T Corp., page 94; Unbundling Comments of WorldCom, pages 43-44; Cerf Letter.

competition from trucks. The rationale for deregulating surface freight transportation – one of the greatest public policy successes ever – was not that railroads faced each and every mode of competition in each and every market, but that, on the whole, they faced competition from various modes. Likewise, in broadband access, it is not necessary that cable, DSL, satellite, and wireless compete directly in each and every market segment. Rather, the force of intermodal competition arises from the different economic attributes of the competing modes. One mode may have competitive advantages in some market segments (e.g., satellite broadband access in rural areas), while another mode may have competitive advantages in some other market segments (e.g., mobile wireless for customers who highly value broadband access across locations).

16. The greatest benefits of intermodal competition come from dynamic changes, as modes strive to gain a competitive advantage or reduce a competitive disadvantage relative to other modes. In freight transportation, for example, the low cost of barge service induced railroads to develop unit-train service, which dramatically reduced their costs of moving bulk commodities. Intermodal competition from trucks induced railroads to develop "piggy-back" service (i.e., containers on flatcars). The same is true with intermodal competition in broadband access: the point is not what the relative attributes of each mode are today, under highly asymmetric regulation, but the potential of each mode with unrestrained incentives for the continuing development and adoption of technologies that improve the reliability, expand the coverage, increase the capabilities and/or reduce the costs of the respective modes.

17. Surely, Dr. Cerf understands these points. As a leading advocate of the Internet, he foresaw, many years ago, its dynamic potential. Yet, then, in its infancy, few others could even imagine how powerful and useful it would become, given further technological advances in networks, servers, user interfaces and the like. Suppose, though,

that we had regulated Internet services (e.g., set prices of Internet access below cost in a quest for "universal service"). Can anyone imagine that we would have experienced the explosive rate of technological change, which in turn has led to the explosive growth in the use of the Internet? Of course not, yet Dr. Cerf's call to regulate one mode of broadband access would hamper the very innovation that will fuel further growth in the Internet.

18. AT&T argues that DSL price increases during the last year are consistent with the exercise of market power.[23] But only if price increases generate monopoly profits is there an exercise of market power. The straightforward explanation of those price increases is that RBOCs used "promotional pricing" of DSL services early in the life cycle of DSL broadband access. As the market began to develop, they raised prices to a level that provides an opportunity to earn a reasonable risk-adjusted rate of return on their investments, past and future. In fact, the business case analysis demonstrates that without those price increases (which are built into the baseline case), the business case for continued investment in DSL-enabling infrastructure would not turn positive within 10 years. That result is consistent with the clear inference of market structure:[24] that RBOCs do not have market power in the market for broadband access.

III. COMMENTS ON THE OECD BROADBAND REPORT

19. It is well worth noting that, with respect to intermodal competition for broadband access, the U.S. is in a very different position from other OECD countries. For

[23] Unbundling Comments of AT&T Corp, pages 75-76.

[24] I.e., the dominance of cable operators over RBOCs in terms of market shares in broadband access.

that reason, the recent OECD "Developments in Local Loop Unbundling" report[25] has limited applicability to U.S. policy. In this section, I will show that the OECD's own data do not support the policy prescriptions offered in the local loop unbundling report.

20. The local loop unbundling report states that "Even though the rate of take-up of unbundled local loops has not been high in a number of OECD countries, the adoption of LLU [local loop unbundling] as a policy helped in accelerating the availability of ADSL. Unbundling in itself, by providing potential competition between carriers, thus helps in accelerating the deployment of broadband services."[26] Not only is there NO empirical support for this statement, data published by the OECD in this report and its previous broadband report[27] indicate that broadband competition is spurred by intermodal competition, not unbundling:

> "Evidence on ADSL deployment has shown that it is in those countries where competition is weak, for example because the incumbent telecom operator also owns the CATV infrastructure, that broadband has not been developed."[28]
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> "Telekom Austria does not own a cable television network. Galvanised by this [cable modem] competition, Telekom Austria's response has been to quickly upgrade its network to provide DSL services."[29]

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[25] "Developments in Local Loop Unbundling," OECD, Working Party on Telecommunication and Information Services Policies, May 2, 2002. (Hereinafter "OECD 2002.")

[26] OECD 2002, page 13, para. 39.

[27] "The Development of Broadband Access in OECD Countries," OECD, Working Party on Telecommunication and Information Services Policies, October 29, 2001. (Hereinafter "OECD 2001.")

[28] OECD 2002, page 15, para. 47.

[29] OECD 2001, page 23.

> "The early launch of cable modem services in Canada spurred the telecommunications carriers to act. In fact, in November 1996, SaskTel became the first telecommunication carrier in the OECD to offer commercial high speed Internet service using DSL technology."[30]

> "Like the other Nordic countries, the rollout of high speed Internet access has been slower than might have been expected. One common factor in Denmark, Finland, Norway and Sweden is that the incumbent telecommunication carriers also own significant shares of the cable network markets."[31]

> "The success being experienced by Korea in the roll out of high speed Internet access is due to competition between companies, different technologies, and infrastructures. There are multiple companies competing with their own broadband infrastructure."[32]

21. In Attachment 4, data are presented regarding broadband market penetration, cable market penetration (i.e., percent of homes passed) and cable/telco ownership in each of the OECD countries. As those data clearly show, cable penetration is much higher in the U.S. than in most other OECD countries. Though the OECD's broadband report states that broadband competition is affected by whether the incumbent local exchange carrier (ILEC) owns the cable network, the eight countries in which the ILEC owns either the only cable network or the largest cable operator have widely varying broadband penetration rates. Moreover, cable networks in the U.S. are generally of much higher quality than in other OECD countries, enabling cable operators here to upgrade their networks to provide broadband access at a lower cost:

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[30] OECD 2001, page 24.

[31] OECD 2001, page 25.

[32] OECD 2001, page 32.

> "Cable modems are at a basic disadvantage in Europe versus DSL for two reasons: first, the vast majority of the cable plant in Europe is archaic and does not support two-way traffic (unlike the US cable plant that went through a major upgrade over the last five years); secondly, and again, in contrast with the US, the copper infrastructure in western Europe is well suited to DSL deployment to such an extent that 80%-90% of households in the major European countries are serviceable."[33]

> "Yankee Group reports that… although cable modem is still cheaper than ADSL in most countries, cable operators have been slow to meet demand across Europe. 'Upgrading cable connections to broadband is more expensive than the equivalent upgrade to DSL, and cable companies don't have the size or economy of scale that a telecom operator has,' noted [senior analyst at Yankee Group, Jonathon] Doran."[34]

Given these substantial differences across OECD countries, the OECD's local loop unbundling report – particularly its emphasis on unbundling over facilities-based competition in broadband access – does not apply to the situation in the United States.

IV. REDUCING REGULATORY ASYMMETRY IN BROADBAND ACCESS

22. Many RBOC competitors, including AT&T, Covad, and WorldCom, are asking for the continuation of current regulation of RBOC broadband services and the extension of unbundling requirements.[35] Although it serves the private interests of these firms, continuing existing regulation of RBOCs' DSL services – much less expanding the unbundling requirements on RBOCs – would be directly contrary to the public interest in promoting broadband investment and facilities-based competition. The business case analysis shows that there is a high degree of inherent riskiness in DSL investments, and additional regulatory restrictions turn an otherwise positive DSL business case negative. For example,

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[33] "Broadband Access: Opening the door to Broadband," Commerzbank, November 2001, page 24.

[34] "ADSL penetration races ahead," ISPworld e-newsletter, March 1, 2002 (downloaded at http://home.ispworld.co.uk/Newsletters/index.cfm?fuseaction=articleprint&articleID =149, 6/20/02).

[35] Unbundling Comments of AT&T Corp., pages 61-64; Unbundling Comments of Covad, pages 9-10; Unbundling Comments of WorldCom, pages 52-61.

the business case analysis shows that if RBOCs are required to unbundle their DSL services and offer a combined UNE DSL service (a UNE-P version of DSL) at prices substantially below current wholesale prices, cumulative cash flows would be driven downward by $2.5 billion, which would seriously impair the abilities of the RBOCs to recover their DSL investments.

23. Competitors contend that TELRIC prices compensate RBOCs for their cost of providing a network element. Covad comments: "TELRIC already allows ILECs to recover the costs of new investments,"[36] and AT&T states: "TELRIC principles give ILECs a right to a full risk-adjusted return on facilities and CLECs offering DSL-based service will pay the full economic cost of upgraded loops."[37] While the TELRIC *principles* may give RBOCs a right to full compensation, it is certainly not true that in practice TELRIC prices are compensatory.

24. To the extent that TELRIC provides an accurate estimate of the actual economic cost of building a network, and to the extent that TELRIC-based prices provide for recovery of ACTUAL costs, TELRIC is a useful tool for establishing UNE prices. In many jurisdictions, though, TELRIC has not been implemented in a way that fully compensates RBOCs for their costs. TELRIC estimates are based on complex cost models with a large number of assumptions and inputs. Unrealistic and inconsistent assumptions and inputs have resulted in unrealistically low TELRIC estimates.

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[36] Unbundling Comments of Covad, page 62.

[37] Unbundling Comments of AT&T Corp., page 72.

25. Covad and WorldCom state that the TELRIC methodology takes risk into account through depreciation rates and cost of capital.[38] Given the application of TELRIC costs in determining UNE prices (in addition to the biases below), this statement is not true. Even though the TELRIC cost models adopted by most states use excessively long depreciation periods, there is typically no requirement that competitors make commitments on the duration of their UNE purchases. So, an ILEC may have to make very long-term investment commitments to provide UNEs to competitive local exchange carriers (CLECs), but the CLECs can buy those UNEs for a short period of time, then switch over to their own facilities (or lease facilities from another CLEC), stranding the RBOC's investment.

26. But the biggest problem with TELRIC pricing is that, even if it is conceptually sound for pricing network elements, it is not being used mainly for that purpose: its main application is in the pricing of network services—UNE-P—for which it is not intended and for which it is conceptually wrong. The Telecom Act provided two different pricing mechanisms for good reason: a resale discount is the appropriate method for pricing services; correctly estimated TELRIC is correct for pricing elements.

> "UNEP is physically similar to resale. In each case, the CLEC uses the ILEC network to provide service to the end-user and essentially limits its own functions to marketing, inputting the order into the ILEC's systems, and billing."[39]

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[38] Unbundling Comments of Covad, page 62; Unbundling Comments of WorldCom, page 69.

[39] "Status and Implications of UNE-Platform in Regional Bell Markets," Kovacs et al., Commerce Capital Markets Equity Research, November 12, 2001, page 2. (Hereinafter "Kovacs et al.")

> "UNEP can be more economic, where the customer's retail bill is high enough. Thus, CLECs have generally preferred UNEP to resale as an entry mechanism, where they have felt entry was economic at all. But they have generally limited themselves to targeting states in which UNEP prices are low and then cherry-picking customers within those states."[40]

27. Moreover, even though TELRIC-based UNE-P prices are already below actual economic costs in many states, AT&T and others have mounted a campaign to further reduce UNE-P prices in many states. Competitors are attempting to ratchet down the UNE-P price by recalculating TELRIC, based on the premise that the costs of "best available technology" have decreased since the currently used TELRIC costs were estimated. But it is completely inappropriate to periodically reapply TELRIC as they request. TELRIC is based on the unrealistic assumption that the entire incumbent network is replaced with a single-vintage of best available technology. Reapplying TELRIC every few years is directly at odds with that assumption and the long depreciation lives used in previous TELRIC estimates.

28. Because telecom is a network industry characterized by large-scale durable assets and rapid technological change, re-applying TELRIC periodically would put TELRIC on a declining cost trajectory that is not achievable, chilling investments from all providers. That downward spiral would have a disastrous effect: "If [there were] radical reductions in the price of UNEP, two things would happen. CLECs would find UNEP entry economic and would begin to enter the market very actively. The RBOCs, in turn, would quickly become uneconomic, as they would be forced to serve customers at prices that are at an 80%-90% discount from the cost on their financial books."[41]

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[40] Kovacs et al., page 2.

[41] Kovacs et al., page 7.

29. In arguing for unbundling of RBOC broadband services, competitors are really seeking UNE-P pricing of DSL services. SBC's experience with broadband unbundling demonstrates this point. As part of the SBC-Ameritech merger agreement with the FCC, SBC committed to make available additional collocation space in its remote terminals and to allow collocation of competitors' Advanced Services Equipment in its central offices.[42] These conditions allow competitors access to SBC's customers served by remote terminals (RTs), enabling them to offer customers a range of DSL services using their own equipment. SBC has invested hundreds of millions of dollars to meet these conditions, yet there has been no CLEC demand for collocation at the RTs.[43]

30. Applying TELRIC to new investments used to provide new network capability, such as broadband, is poor policy. By its nature, unbundling reduces incentives for investment, but that disincentive effect is increased exponentially when rapid technological change can cause early technological obsolescence.[44] Consider the effect of requiring Intel to unbundle its manufacturing plants and price those unbundled elements at TELRIC. Even worse, imagine requiring Intel to sell its Pentium 4 chips to its competitors at downward-biased TELRIC prices—which is the correct analogy to UNE-P pricing of DSL. Can anyone imagine that Intel would continue to spend such a large share of its revenues on R&D, or make even riskier investments in new semiconductor manufacturing facilities? Of course not.

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[42] Second Memorandum Opinion and Order, *In the Matter of Ameritech Corp., Transferor and SBC Communications, Inc., Transferee For Consent to Transfer Control of Corporations Holding Commission Licenses and Lines Pursuant to Sections 214 and 310(d) of the Communications Act and Parts 5, 22, 24, 25, 63, 90, 95, and 101 of the Commission's Rules*, CC Docket No. 98-141, Released September 8, 2000, paras. 35-36.

[43] Ameritech Illinois' Brief on Rehearing, Before the State of Illinois, Illinois Commerce Commission, *In the Matter of Proposed Implementation of High Frequency Portion of Loop (HFPL)/Line Sharing Service*, Docket No. 00-0393, August 3, 2001, page 17.

[44] Early technological obsolescence occurs when the economic life of an asset is less than its physical life, due to rapid technological change.

31. A DSL version of UNE-P would not only discourage investment by the RBOCs, it also would discourage investment in broadband services by competitors, including CLECs, cable providers, and mobile wireless providers. UNE-P can lower expected returns that competitors could make on broadband investments. Even if investment disincentives only reduce investment at the margin, they can substantially slow carrier deployment of new services because of the effect on competitive dynamics.

32. WorldCom argues that because cable companies are not required to provide open access on a nondiscriminatory basis at regulated prices, the FCC needs to regulate ILECs to ensure an entry path for Internet Service Providers (ISPs).[45] But the issue is not whether ISPs have access to DSL service at wholesale prices, but what those prices are. The baseline case assumes that a significant share of DSL customers on RBOC networks will be served by ISPs or other resellers, at wholesale prices that reflect retailing cost savings. The risk to DSL investment is from requiring UNE-P pricing of DSL service, at rates that are lower than actual costs, which would destroy the economic rationale for the DSL investment. On this point, it is worth noting that when cable companies are required to provide open access, the wholesale price of access is not regulated. To gain regulatory approval for their merger, AOL and Time Warner agreed to allow multiple ISPs to offer service over Time Warner's cable network. Terms of the agreements with the FTC and FCC included technical specifications and the inclusion of a most favored nation clause in ISP contracts. Prices for access, however, are negotiated between the ISP and AOL Time Warner, and are not subject to regulatory oversight.[46] Publicly available information suggests that ISPs are paying

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[45] Unbundling Comments of WorldCom, Inc., pages 44-47.

[46] "FTC Approves AOL/Time Warner Merger with Conditions," Federal Trade Commission Press Release, December 14, 2000 (downloaded at www.ftc.gov/opa/2000/12/aol.htm, 3/15/02).

approximately $30 to $35 per month for access to customers using cable modem service,[47] which is in line with DSL wholesale offerings by the RBOCs[48] but well above a UNE-P price for DSL.[49]

33. Two other multiple system operators (MSOs) recently announced agreements with ISPs that allow the ISPs to offer high-speed cable Internet service over their networks – AT&T Broadband with EarthLink[50] and Comcast with United Online. [51] Comcast President Brian Roberts explains that cable companies have an incentive to enter into multiple ISP arrangements because they create more opportunities for growth in their broadband businesses: "This is a business opportunity as we want to get the maximum penetration of broadband…The real payoff is in expanding the market from 10 percent to much higher penetration in the years ahead."[52] The FCC's hands-off approach to regulation is encouraging healthy competition – with wholesale prices determined by the market, not by regulators.

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[47] "AT&T to Offer Earthlink Inc. On Cable Lines," Wall Street Journal, March 13, 2002; "Comcast, United Online Set Deal For Internet Service on Cable Lines," Wall Street Journal, February 27, 2002; "Time Warner, EarthLink Reach Deal," Washington Post, November 21, 2000; "Comcast to share network," Harrisburg Patriot, February 27, 2002.

[48] RBOC wholesale pricing for DSL service ranges from approximately $33 to $44 for speeds of 1.5Mbps downstream and 128Kbps upstream, depending on volume and length of term commitments. See BellSouth (www.bellsouth.com), Verizon (www.verizon.com), and SBC (www.sbc.com) Web sites.

[49] UNE-P discounts for traditional voice services range between 38% and 61% off the retail price. Applying this to the DSL retail rate (minus the ISP charge) will result in a UNE-P price for DSL that is much lower than the wholesale rate. *See* Kovacs et. al., page 6.

[50] "AT&T to Offer Earthlink Inc. On Cable Lines," Wall Street Journal, March 13, 2002.

[51] "Comcast Inks Access Deal With United Online," *Cable Datacom News*, March 1, 2002.

[52] Ibid.

34. AT&T and WorldCom argue that ILEC investments in DSL services to date indicate that regulations do not hamper ILEC incentives to invest.[53] The Commission should not draw false inferences from the RBOCs' DSL investment to date. The financial returns on DSL investment change rather dramatically as DSL upgrades move from the "core" of the network to its "periphery." When the fixed costs of network investments can be spread across many customers (i.e., dense urban areas), unit costs are considerably lower. When upgrading in low-density towns and rural areas, those facilities will be shared by fewer users, causing the cost of providing DSL service to be much more costly than in urban areas. Unless the Commission acts to remove regulations that serve as disincentives to network investment, extending the availability of DSL to the large majority of households will not be financially viable.

35. Moreover, continued investment in DSL infrastructure has occurred, in part, because the public comments of FCC Commissioners indicate recognition of the need to increase incentives for facilities-based competition and investment in advanced telecommunications infrastructure. FCC Chairman Michael Powell has repeatedly stated his commitment to facilities-based competition. In October 2001, he said that "Commission policy should provide incentives for competitors to ultimately offer more of their own facilities… [to] decrease reliance on incumbent networks."[54] Commissioner Abernathy stated that to "restore the incentives for facilities-based investment… [there must be] a shift away from policies that actively encourage resale as a long-term business strategy and force the unbundling of virtually every network element at TELRIC rates."[55] Commissioner Martin

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[53] Unbundling Comments of AT&T Corp., pages 65-66; Unbundling Comments of WorldCom, pages 97-100.

[54] Remarks of FCC Chairman Michael K. Powell, "Digital Broadband Migration" Part II, October 23, 2001.

[55] Address by Commissioner Kathleen Q. Abernathy, "Competition Policy Institute Forum: *Keeping Telecom Competition on Track*," December 7, 2001.

also agreed that the Commission needs "to place a high priority on facilities-based competition…" in order to increase incentives for the "deployment of new facilities that could be used to provide broadband."[56] If the Commission does not act now to carry out those steps, it should expect a further reduction in DSL investment and a slower rate of adoption of broadband services.

36. I would urge the Commission to consider that the policies it adopts through this and related proceedings will affect far more than the deployment and adoption of current generation technologies for broadband access. Current broadband access technologies are just the first stage of technological development. In each mode of broadband access, bandwidth will increase substantially, by an order of magnitude over first-generation broadband. Whereas access speeds in the analog access world were measured in tens of kilobits per second (i.e., 9.6-56 kbps), the current generation of broadband access is measured in hundreds of kilobits per second (i.e., 256-1,544 kbps). The next generation of broadband access will be measured in the thousands of kilobits, i.e., megabits. These speeds will be needed to support bandwidth intensive applications such as online gaming, video-on-demand, and streaming video.[57]

37. However, until a substantial number of subscribers have adopted first-generation broadband, the development of broadband applications will not develop sufficiently to create the demand for even higher bandwidth access or applications. Given the substantial investment required to implement next-generation services, current adoption is

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[56] Separate Statement of Commissioner Kevin J. Martin, Re: Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, CC Docket No. 98-146, February 6, 2002.

[57] CIBC, page 9.

critically important. For example, one analyst estimates that the cost to implement fiber-to-the-home, which will pave the way for next-generation applications offered by the ILECs, will be approximately $5,000 per subscriber, assuming a 50% penetration rate. This estimate increases to over $9,000 if the penetration is 25%.[58] Thus, it is crucial to adopt and implement public policies that clear away the regulatory obstacles and disincentives that are inhibiting innovation and investment in the current generation of broadband access technologies, in order to promote continued rapid technological innovation and the deployment of next-generation technologies.

38. Given the potential rate of technological change and the dramatic increases in intermodal competition, regulation of broadband services would be especially harmful because of its long-term dynamic effects. The convergence of content with communications capability is stimulating intermodal competition. Removing regulatory obstacles on DSL will foster continued growth in broadband services, creating conditions for further investment in higher speed services and enabling the realization of video-on-demand and video streaming, and increasing competition in Internet-based competition with traditional cable video services. Moreover, the proper incentives for infrastructure investment also provide "upstream" incentives for network equipment manufacturers to invest in R&D to improve their respective technologies.[59] Intermodal competition between service providers like BellSouth and AT&T Broadband also increases competition between equipment manufacturers like Lucent and

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[58] CIBC, pages 23-24.

[59] "As observed by Justice Breyer: 'mandatory unbundling comes at a cost, including disincentives to research and development by both ILECs and CLECs and the tangled management inherent in shared use of a common resource.' Iowa Utilities Board, 525 U.S. at 428-29." *See* United States Telecom Association, et al., v. Federal Communications Commission, et al., 290 F.3d 415 (D.C. Cir. 2002), Section III. The Line Sharing Order. (Hereinafter "Circuit Court Decision.")

Scientific Atlanta.[60] Unless the Commission takes steps to substantially reduce its regulation of DSL, the regulatory asymmetry between RBOCs and MSOs will further distort facilities-based competition and bias the course of technological innovation and adoption.

V. COMMENTS ON RECENT SUPREME COURT AND D.C. CIRCUIT COURT DECISIONS

39. The United States Supreme Court recently reversed an earlier decision by the United States Court of Appeals for the Eighth Circuit, in effect upholding the FCC's rule for TELRIC pricing of unbundled network elements and its rule requiring Bell companies to bundle uncombined elements when requested by CLECs.[61] In combination, these two rules generate the so-called UNE platform, or "pseudo unbundling," which requires RBOCs to sell wholesale service at a TELRIC price that is well below the regulated wholesale price. At the same time, the high court refused to reverse two other decisions by the 8th Circuit that were challenged by ILECs – the lower court's decision upholding the FCC's basic forward-looking cost philosophy, the underpinning of the agency's TELRIC regime, and the 8th Circuit's decision that use of TELRIC did not present a "takings" claim.[62] Frankly, as an economist, I strongly disagree with Justice Souter's economic reasoning in the decision. In my professional opinion, Justice Breyer, in his dissenting opinion, demonstrates a much better understanding of the policy objectives of the Telecom Act, of the economics of unbundling and facilities-based competition, and of how the FCC's implementation of TELRIC and

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[60] Leading manufacturers of DSL and cable modems, respectively.

[61] Verizon Communications Inc., et al., v. Federal Communications Commission et al., 535 U.S. ___, 122 S.Ct. 1646, (2002). (Hereinafter "Supreme Court Decision.")

unbundling are contrary to those objectives. However, the majority of the Court having decided that TELRIC pricing is legally permissible, the issue now becomes, "is TELRIC pricing of broadband access good public policy?"[63] It most decidedly is not.

40. The Supreme Court decision seems to be addressing only voice-grade services, given the omission of any recognition of intermodal competition to ILECs from cable operators. In claiming that "Some loop lines employ coaxial cable and fixed wireless technologies, but these constitute less than 1 percent of the total number of reported local-exchange lines in the United States," [64] Justice Souter heavily discounts intermodal competition in voice grade services[65] and completely ignores intermodal competition in broadband access services. By considering only *intra*modal competition for voice grade services, one might make a passable case for unbundling loops (though not for TELRIC pricing of UNE-P). However, to apply the same logic to broadband access makes no sense whatever. As shown in Section II, ILECs are NOT the incumbent providers for broadband access, NOR do they have market power in the market for broadband access. Indeed, ILECs not only have a lesser share of the broadband access market than cable operators, but also

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[62] Supreme Court Decision, page 25.

[63] While TELRIC pricing of the UNE-Platform is also harmful to investment in voice-grade services, I will address only the broadband implications.

[64] Supreme Court Decision, page 17, footnote 10.

[65] Eighteen percent of cell phone owners consider their cellular phone, not their home phone, to be their "main phone." ("18% See Cell Phones As Their Main Phones," *USA TODAY*, January 31, 2002.) One in five consumers reported that they use their wireless phone for "most" of their calling, with one in ten using wireless for all of their long distance calling, and "most" of their local calling. ("Wireless Continues to Displace Traditional Telephone Service," WirelessArena.com, June 10, 2002.)

continue to suffer from asymmetric regulations which seriously disadvantage them in competing with cable operators, as explained in Section IV above.

41. Moreover, the harmful effects of TELRIC pricing of UNE-P, bad enough for voice-grade network investment incentives, are even worse on the incentives for investment in broadband and other advanced services. The Supreme Court decision refers to the "legacy" telephone network that was largely in place when the Telecom Act was passed in 1996, but ILECs must continue to invest in their voice networks to meet growing demands of new customers and increased usage (e.g., much higher usage of local exchange service for dial-up Internet access). Broadband access networks were NOT in place at the time of the Act, and, moreover, the degree of risk is far greater for broadband investments than for replacement or expansion of voice-grade facilities. As shown in the DSL business case analysis, the market and technology risks are much higher for broadband investments, making it a close call in terms of the capital budgeting decision. If the FCC does not reduce the regulatory burdens on DSL investment – much less if it increases them – it will substantially reduce the incentives for investment in broadband. So, while the Supreme Court decision may allow the Commission to use TELRIC pricing on unbundled elements, the Commission should exercise its policy prerogative to reduce the regulatory burdens and obligations on the broadband facilities of ILECs by eliminating unbundling requirements on those facilities.

42. Such a policy is fully consistent with the reasoning and findings of the recent D.C. Circuit Court decision. Indeed, if applied in good faith, the Circuit Court decision would, as a matter of economic logic, compel such a policy. Whereas the Supreme Court decision finds that TELRIC pricing of UNEs is legally permissible under the Telecom Act,

the Circuit Court decision addresses the more fundamental question of the unbundling requirements themselves. Needless to say, if the Commission rightly finds that the unbundling of DSL facilities should not be required, then TELRIC pricing of those facilities becomes moot.

43. While specifically addressing the Commission's Line Sharing Order, the Circuit Court's findings are more generally applicable to the unbundling of DSL facilities, when it agrees that:

> "the Commission, in ordering unbundling of the high frequency spectrum of copper loop so as to provide DSL services, completely failed to consider the relevance of competition in broadband services coming from cable (and from a lesser extent satellite)… The Commission's own findings… repeatedly confirm both robust competition, and the dominance of cable, in the broadband market… In sum, nothing in the Act appears a license to the Commission to inflict the sort of costs noted by Justice Breyer under conditions where it had no reason to think doing so would bring on a significant enhancement of competition. The Commission's naked disregard of the competitive context risks exactly that result."[66]

Given the importance of broadband deployment and adoption to the recovery of the telecom sector and the U.S. economy, the Commission should follow the Circuit Court's guidance by eliminating the unbundling requirements on DSL facilities, to spur even greater facilities-based intermodal competition in broadband services.

[66] Circuit Court Decision, Section III. The Line Sharing Order.

44. The adoption of a national rule that eliminates the mandatory unbundling of DSL facilities does not conflict with the Circuit Court's finding about the "unvarying scope" of the Commission's Local Competition Order:

> "As to almost every element, the Commission chose to adopt a uniform national rule, mandating the element's unbundling in every geographic market and customer class, without regard to the state of competitive impairment in any particular market. As a result, UNEs will be available to CLECs in many markets where there is no reasonable basis for thinking that competition is suffering from any impairment of a sort that might have [been] the object of Congress's concern."[67]

This reasoning is sound for legacy network elements such as loops or switches because there is substantial variation in the availability of alternatives to ILEC facilities. Given the extent of intermodal competition in broadband services – actual and potential – it makes sense to adopt a national rule, because there is much less variation in the availability of competitive modes of broadband access. And, if the Commission adopts a national rule eliminating DSL unbundling requirements, there will be even more facilities-based intermodal competition in the near future.

[67] Circuit Court Decision, Section II.A. Unvarying Scope.

45. If intermodal competition in broadband services indicates there is no need to require unbundling of DSL facilities, the disincentives to innovation and investment caused by unwarranted unbundling indicate that there is actual harm from doing so. As to investment, the Commission should avoid the "past investment" fallacy – that investment by CLECs or ILECs is evidence that there are no disincentive effects from excessive unbundling requirements.[68] In the words of the D.C. Circuit Court:

> "…the petitioners argued before the Commission that mandatory unbundling at Commission-mandated prices reduces the incentives for innovation and investment in facilities… The Commission's only response is to point to evidence that both CLECs and ILECs have built facilities since passage of the 1996 Act… But the existence of investment of a specified level tells us little or nothing about incentive effects. The question is how such investment compares with what would have occurred in the absence of the prospect of unbundling."[69]

As Justice Breyer similarly reasoned,

> "I recognize that no regulator is likely to enforce the Commission's rules so strictly that investment literally slows to a trickle. Indeed, the majority cites figures showing that in the past several years new firms have invested $30 to $60 billion in local communications markets… We do not know how much of this investment represents facilities, say broadband, for which an incumbent's historical network offers no substitute. Nor do we know whether this number is small or large compared with what might have been… Regardless, given the incentives, this independent investment would seem to have been made despite the start from scratch rules, not because of them. At best, such statistics do no more than show that at least some of the coincidences I describe below have, happily for the Commission and the public alike, come to pass."[70]

One would surely hope that the Commission would recognize that the burst of CLEC investment in the late 90's occurred not because of unbundling, but because of a capital

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[68] Justice Souter commits this logical fallacy by asserting that "actual investment in competing facilities since the effective date of the Act simply belies the no-stimulation arguments conclusion." *See* Supreme Court Decision, page 32.

[69] Circuit Court Decision, Section II.A. Unvarying Scope.

[70] Opinion of Justice Breyer in the Supreme Court Decision, pages 14-15.

market bubble during which investors threw money at any high-tech venture which promised high growth rates, lack of profits notwithstanding. Those days are over and, hopefully, will not soon return. In a rational market environment, it is imperative that the Commission adopt policies that will create the proper long-term incentives to stimulate efficient investment in enduring assets – the kind that generate profits by generating value to customers. By eliminating unbundling requirements on broadband facilities, the Commission will be taking a major step in that direction.

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EDUCATION

Ph.D., M.A., Economics, University of California, Berkeley, 1973-77
Fields: Industry Analysis, Competition Policy & Business Strategy
Alfred P. Sloan Dissertation Fellowship; Phi Beta Kappa, 1977

B.A., M.A., Social Science, Michigan State University, 1961-65, 1972-73
President, All-University Student Government (elected by student body)
Blue Key and Excalibur Honorary Fraternities

PROFESSIONAL EXPERIENCE

LECG, LLP, Emeryville, 1993-present, Director

Played key role in growth of LECG, development of professional staff from 50 to 400 and expansion from one to thirteen offices worldwide; served on Board of Directors, Executive Committee and Operations Committee; served as Managing Director of Telecommunications Practice, 1993-2000.

Consultant to telecommunications service providers and equipment vendors on industry analysis and competitive strategy; technological innovation and new product introductions; mergers, acquisitions and corporate restructuring; market entry and competitive dynamics; price analysis and pricing models; cost models and costing; public policy analysis and advocacy (Addendum A).

Expert testimony on telecommunications, emerging technologies, competitive dynamics and competition policy issues before U.S. Congress, state legislatures, FCC, DOJ, ICC, CRTC and regulatory commissions of 27 states (Addendum B).

Expert testimony before state and Federal courts in business litigation regarding antitrust, competition, price fixing, monopolization, collusion, mergers, contracts, fair trade, patents and copyrights (Addendum C).

Kivera, Inc., Oakland, CA, 2001: Executive Vice President

Executive leadership role in privately funded software development company offering navigational and location-based services for Internet, intranet and wireless applications; responsible for strategic planning, strategic alliances, business development, product management, sales and marketing.

EconomInc, 1981-93, Berkeley

Founder and President: consulting in telecommunications, transportation, strategy and public policy; expert testimony in regulatory proceedings and business litigation.

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Haas School of Business, UC Berkeley, 1977-96, active duty, now Professor Emeritus:

Taught undergraduate, MBA and doctoral courses in managerial economics, business & public policy, industry analysis & competitive strategy, telecommunications economics, policy & strategy (Addendum D).

Leadership role in School and campus governance, as Chair of the Business & Public Policy Group, Member of the Executive Committee of the School, Chair of the Policy & Planning Committee (elected by faculty) and Director of Executive Education; active in academic journals, professional societies and government service (Addendum E).

Conducted original academic research on competition and regulatory policy, technological innovation, competitive strategy, telecommunications and transportation; published research in journals of business, economics, law, management and public policy (Addendum F).

Gave speeches and presentations to academic societies, university seminars and workshops, professional & trade associations, public policy forums and corporate conferences (Addendum G).

Interstate Commerce Commission, Washington, DC, 1980-81:

Deputy Director: managed staff of 160 analysts in three sections: Cost, Economic & Financial Analysis; played instrumental role in the implementation of Congressional acts deregulating the railroad and motor carrier industries; appointed to **Senior Executive Service** by President Jimmy Carter, 1980.

ARTrain, Michigan Council for the Arts, Detroit, 1971-72:

Director: recruited, trained and supervised staff of 15 artists and technicians who operated traveling art gallery and demonstrations throughout the state; coordinated visits with local community organizers.

Young America Corporation, St. Louis, 1969-71:

Founder, CEO & Chairman: raised $500,000 in venture capital for national direct marketing company serving the college market; published and direct-mailed over one million catalogs featuring women's clothing and accessories; developed network of student sales representative on 250 college campuses.

Student Coalition for Congressional Action, Wash DC, 1968-69:

Founder, Executive Director**:** raised funding; organized college students involved in the Rockefeller, Humphrey, Kennedy and McCarthy Presidential campaigns on more than 800 campuses to lobby Congress to pass the 26th amendment to the U.S. Constitution, lowering the voting age to 18.

Humphrey-Muskie for President Committee, Washington D.C., 1968:

Vice Chairman, Young Citizens' Campaign: organized student campaigns and get-out-the-vote drives in the Northeast and Midwest states.

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Rockefeller for President Committee, New York, 1968:

National Director, Student and Young Adult Campaign: recruited, trained and supervised staff of 25, who organized college and high school students and young adults in more than 1000 towns and cities; coordinated with the candidate's advance team to ensure large turnouts for public appearances.

TIME Magazine, New York, 1967-68:

Special Assistant to the Publisher: conceived and organized *Choice '68*, the National Student Presidential Primary, a mock election held on 1500 college campuses on April 28, 1968; more than 2 million students voted.

National Student Marketing Corporation, Washington, DC, 1966-67:

Vice President of Sales & Marketing: recruited and managed network of student sales representatives on 500 college campuses, selling specialty products and services (e.g., student travel, product sample distribution, magazine subscriptions, airlines discount cards).

Office of the Governor, State of Oregon, Salem, 1966:

Special Assistant to Governor Mark O. Hatfield: conducted research and assisted in speech-writing; traveled with the Governor to public appearances; organized student involvement in U.S. Senate campaign.

General Motors Corporation, Warren, MI, 1965:

Public Relations Field Representative: delivered high school assembly programs and conducted radio and TV interviews regarding technological innovation and new product development in the automotive industry.

PERSONAL

Married 32 years to Linda K. Harris, former high school English teacher and managing partner of Creative Media Services; daughter Kirsten is a senior at University of Colorado, Boulder; son Brandon is a freshman at Washington University, St. Louis; members of Claremont Country Club and the Berkeley Tennis Club. Member, Board of Trustees, The College Preparatory School.

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ADDENDUM A: CONSULTING

Consulting to Business & Industry

Pacific Telesis: sale of public communications line of business; spin off of wireless properties (AirTouch); development of corporate strategy for advanced services

Pacific Bell: pricing structure of local exchange and enhanced services; competitive strategy, broadband deployment and entry into video program distribution, new product introduction; development of corporate strategy for changing state regulatory policy from rate of return to price regulation; reciprocal compensation arrangements among local carriers

U S WEST: acquisition of cable TV distribution systems and formation of Media One

US WEST Communications: regulatory policy, costing and pricing principles, local competition and interconnection; development of corporate strategy for changing state regulatory policy from rate of return to price regulation; reciprocal compensation arrangements among local carriers

Ameritech: price regulation; local competition policy; development of corporate strategy for changing state regulatory policy from rate of return to price regulation; entry into long distance services; reciprocal compensation arrangements among local carriers

IBM: implications of networked computing for market structure and competitive dynamics in the property casualty insurance industry

Lucent: implications of emerging competition in local exchange telephone services for switching equipment and related equipment markets

Nortel: adoption of ISDN; effects of acquisition or sale of assets on competition in advanced telecommunications desktop equipment (smart-phones, screen-phones)

Bell Communications Research: public benefits of basic and applied research and development projects and leading-edge telecommunications technologies

BellSouth Corporation: effects of rate of return versus incentive regulation for adoption of new digital technologies in local telephone service; corporate restructuring of wholesale, retail businesses; implications of the Internet for local and long distance telephone service

BellSouth Communications: development of corporate strategy for changing state regulatory policy from rate of return to price regulation

Telus: implications of broadband deployment by local exchange telephone carriers for competition in Canadian market for video program distribution

AGT and Stentor Companies: Canadian interconnection and local competition policy

Iusacell: Mexican interconnection and local competition policy

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Southern New England Telephone: development of corporate strategy for changing state regulatory policy from rate of return to price regulation

CNW Railroad: corporate restructuring (joint ventures, merger, acquisitions and sale of assets)

Southern Pacific: route rationalization analysis (economic model for branch line abandonments); pricing of joint trackage rights

American Presidents Intermodal: economics of joint venture or strategic alliance with major rail carrier; implications of rail mergers for competition in intermodal traffic

Consulting to Government Agencies

Economic Planning Agency, Japan: comparative analysis of telecommunications policy reforms in Japan, USA and UK

California Corporation for Economic Development: analysis of benefits of regulatory reforms in the adoption of new technologies in telecommunications

California Department of Consumer Affairs: industry analysis; technology innovation and adoption; telecommunications policy

California Office of Attorney General: resale price maintenance and distribution policies in video game consoles and games; pricing of infant formula; consolidation of grocery retailing industry and emergence of club stores

Interstate Commerce Commission: rail rate regulatory policy; rail merger policy; rail costing methodologies; branch line abandonment policy and process

Office of Technology Assessment: role of regulatory policy in technological innovation and adoption in the telecommunications industry

U.S. Department of Justice: competitive analysis of office equipment market

U.S. Department of Transportation: railroad line consolidation and rationalization; railroad merger policy; freight transportation regulatory policy

U.S. General Accounting Office: surface freight transportation policy

Vita: Dr. Robert G. Harris

ADDENDUM B: EXPERT TESTIMONY IN REGULATORY PROCEEDINGS

Testimony presented on behalf of:

Pacific Bell: incentive regulation; pricing of new products and services; public benefits of broadband deployment; pricing of business communications services; methods of cost allocation for multi-use public networks; public benefits of LEC entry into long distance telephone services; implications of broadband deployment by local exchange telephone carriers for competition in market for video program distribution; service quality regulation; reciprocal compensation for interchanged Internet access traffic

US WEST: incentive regulation; costing methodologies for unbundled network elements and wholesale pricing of local telephone service and pricing principles; local competition and interconnection policy; public benefits of LEC entry into long distance telephone services; reciprocal compensation for interchanged Internet access traffic

Ameritech: price regulation; pricing of local exchange telephone services local competition policy; reciprocal compensation to competitive local exchange carriers; reciprocal compensation for interchanged Internet access traffic

GTE: effects of WorldCom-MCI merger on competitive in the markets for long distance services and Internet backbone services

Bell Atlantic: conversion from rate of return to price regulation; competitive implications of FCC telephone and cable price regulation

NYNEX Mobile Services: FCC spectrum auction rules

BellSouth: conversion from rate of return to price regulation; local competition and interconnection policy; competitive effects of WorldCom acquisition of MCI in Internet backbone services; competitive effects of WorldCom acquisition of SPRINT long distance services and Internet backbone services

Southwestern Bell: conversion from rate of return to price regulation; local competition and interconnection policy; reciprocal compensation for interchanged local traffic and Internet access services; provision of UNE's

General Telephone: pricing of local exchange telephone services

U S West New Ventures: effects of FCC resale policies on competition in mobile communications services

PCS Primeco: competitive dynamics in mobile communications: implications of industry consolidation for bidding processes in spectrum auctions

Bell Atlantic Mobile Services: implications of FCC spectrum auction rules for competitive bidding and competition in mobile communications services

United States Telephone Association: FCC price regulation

Vita: Dr. Robert G. Harris

MFJ Task Force: public benefits of judicial relief from MFJ manufacturing restriction for research & development, technological innovation and adoption

AGT and Stentor Companies: Canadian interconnection and local competition policy

Iusacell: Mexican interconnection and local competition policy

GTE Wireless: economic benefits of Federal pre-emption of state regulation of prices of mobile communications services

SPRINT: public benefits of emerging technologies in telecommunications

UPS: implications of emerging information technologies for competitive dynamics in express package delivery services

Western Coal Traffic League: railroad pricing for bulk commodities

Consolidated Freightways: motor carrier pricing (multipoint volume discounts)

Southern Pacific Railway: competitive effects of railroad mergers; pricing of joint trackage rights; competitive access to essential intermodal facilities

Santa Fe Railroad: competitive effects of railroad mergers and competitive access to essential port facilities

American Presidents Line: competitive effects of railroad mergers; competitive access to essential intermodal facilities

Testimony presented to Legislative Bodies & National Regulatory Agencies:

Joint Economic Committee, U.S. Congress
Commerce Committee, Judiciary Committee, U.S. Senate
Commerce Committee, U.S. House of Representatives
U. S. Department of Justice
Interstate Commerce Commission
Federal Communications Commission
Canadian Radio-Television and Telecommunications Commission
Mexican Secretariat of Transportation and Telecommunications
Ohio State Legislature
California Assembly; California Senate

Testimony presented to State Public Utility Commissions:

Arizona, California, Colorado, Florida, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Minnesota, Montana, Nebraska, Nevada, New Mexico, Ohio, Oregon, Pennsylvania, Tennessee, Texas, Utah, Virginia, Washington, Washington DC, West Virginia, Wisconsin, Wyoming

Vita: Dr. Robert G. Harris

ADDENDUM C: EXPERT TESTIMONY IN BUSINESS LITIGATION

Conducted and supervised economic analyses of market structure and competitive dynamics; costs, prices and pricing practices; market entry and exit; mergers, acquisitions and restructuring; and technological innovation and adoption; offered testimony in state and Federal courts involving many industries (clients):

Construction Services and Building Products

PG&E: electrical systems installation, nuclear power plant

Luminoptics: technological innovation and adoption in the market for lighting ballasts for commercial and industrial buildings

Shell Oil et al: pricing of fabricated pipe and fittings for oil refineries, power plants, pulp mills and other continuous flow production facilities

Entertainment, Publishing & Advertising

Universal Studios: motion picture production and distribution rights

UA Theatres; Fox-Festival Theatres; Syufy Theatres; Act One Theatres: distribution and theatrical exhibition of first-run movies

TCI: implications of interactive TV technologies for competition in cable services and in-home entertainment

Fox Films: premium cable television distribution of feature length films

United Artists: effects of merger of premium cable movie channels on fees paid to film production companies

Distribution Services

Barnes & Noble: competition in book retailing; implications of on-line sales for book retailing

Albertson's: effects of merger with American Stores on competition in grocery retailing

Good Guys: competition in retail sales of mobile communications handsets and services among alternative channels of distribution

Hahn Development: regional shopping center development and retail leasing

Yamaha: wholesale and retail distribution of musical instruments

Goody: wholesale distribution of personal care products

California AG: retail distribution of replacement tires; vertical restraints in retail sale of video game consoles and games

Health Care Services

California Vision Care Plan, Arizona Vision Care Plan: competition in benefit plans for optometric vision care services for large employers; competition in the market for optical goods

Vita: Dr. Robert G. Harris

Transportation Services

Kaiser Steel: contract motor carriers in steel manufacturing and distribution

Litton: inland waterway carriage and dock services for iron ore

Florida East Coast Railway: pricing of through-train services and vertical restrictions in the rail freight industry

High Technology Manufacturing & Software

SONY Entertainment: effects of software emulation on competition and innovation in video game consoles and games

Ascend Communications: effects of merger with Cascade Communications on competition in markets for carrier-class Internet access equipment

Advanced Fiber Communications: digital loop carriers systems for telephone

SUN Microsystems: effects of Microsoft acquisition of WebTV on competition in the markets for servers, server operating systems and Internet device operating systems (Java, WCE)

QualCom: implications of technological innovation for competition in mobile communications handsets and components

Bio-Rad: diagnostic equipment for manufacture of integrated circuits from silicon wafers

Advanced Micro Devices: semiconductor industry (CPUs for PCs) ()

Bio-Rad: biotechnology equipment for monoclonal antibody research

Telecommunications & Information Services

Pacific Bell: resale of telecommunications equipment and services; provision of collocation facilities and unbundled network elements to independent providers of DSL services; provision of access to operational support systems for resale of local exchange telephone services

SW Bell: pricing of terminating access to competitive local exchange carriers

AirTouch: retail sale of mobile communications services through kiosks in warehouse and club stores; competition with other distribution channels

GTE Wireless: pricing of mobile communications services for resale

Siemens-Rolm: after-market servicing of telecommunications equipment (PABXs)

Allied Signal: on-line transaction services for the mass transit industry

Vita: Dr. Robert G. Harris

ADDENDUM D: TEACHING

***Undergraduate Courses, UC Berkeley*:**

Political, Social and Legal Environment of Business
Telecommunications Economics & Policy
Business and the Global Economy

***Graduate Courses, UC Berkeley*:**

Business and Public Policy (MBA Core Course)
Microeconomic Analysis for Managerial Decisions (MBA Core Course)
Industry Analysis and Competitive Strategy
Telecommunications Economics, Policy & Strategy
Antitrust Law (School of Law, with L. Sullivan)
Antitrust Economics (Department of Economics)

***The Executive Program, University of California, Berkeley*:**

Industry Analysis & Competitive Strategy
Competitive Strategies in Telecommunications and Information Services
Strategies for Effective Public Policy Advocacy
Managing Business-Government Relations

Telecommunications Executives, University of California, Berkeley

Organized and taught one-week course in telecommunications economics, competition, corporate strategy and public policy for executives from telecom users and service providers, equipment vendors and public officials

Executive Education, Center for Telecommunications Management, University of Southern California

Half-day seminars in telecommunications economics, competition, corporate strategy and public policy for executives of leading telecommunications service providers and suppliers, from North America, Europe, Asia and Latin America

On-Site Executive Education

Pacific Bell: organized and taught ten-week seminar for 300 mid-upper level managers on emerging technologies & competitive strategies in telecommunications

Deutsche Telecom: organized and taught one-week course on U.S. telecommunications industry developments and regulatory policies

California Public Utilities Commission: one-week course in telecommunications economics & public policy, taught to Commission staff ten times

Ministry of Post & Telecommunications, Japan: seminar series on U.S. telecommunications industry developments and regulatory policies

Vita: Dr. Robert G. Harris

ADDENDUM E: UNIVERSITY, PROFESSIONAL & GOVERNMENT SERVICE

Academic Awards

Charles Slater Award for Outstanding Contributions to Macromarketing, 1987

Schwabacher Prize for Outstanding University Service, 1983

Walter A. Haas School of Business

Chair, Business and Public Policy Group (1983-84, 1986-93)

Chair, Program in Business and Social Policy (1986-90)

Business School Building Program Committee (1986-91)

Business School Capital Campaign Committee (1989-93)

Ph.D. Field Advisor, Business and Public Policy (1981-87; 1989-91)

Policy and Planning Committee (1991-3; Chair, 1992-93)

Member, Board of Directors, Washington Campus Program (1990-93)

Director, The Executive Program (1983-85)

Director, Executive Programs in Telecommunications (1989-92)

Chair, Executive Education Task Force (1991-93)

Member, Board of Directors, Berkeley Center for Executive Development

University of California, Berkeley

Executive Committee, Center for Research in Management (1989-96)

Advisory Board, Lester Center for Innovation and Entrepreneurship (1992-96)

Chancellor's Advisory Committee on Parking (1988-89)

Executive Committee, National Financial Services Center (1986-88)

Executive Committee, Institute of Transportation Studies (1981-83)

Director, Center for Transportation Policy Research (1980-82)

University of California (Systemwide)

Working Group on Technology Transfer (1988-90).

Task Force on Telecommunications & Information Policy Research (1984-85)

Vita: Dr. Robert G. Harris

Service to Professional Journals & Societies

Chair, Ninth Annual International Conference of the Strategic Management Society, San Francisco (1989)

Associate Editor, California Management Review

Associate Editor, Logistics and Transportation Review

Editorial Advisory Board, Transportation Research

Active Member and Participant in *American Economic Association, Academy of Management, Strategic Management Society, International Telecommunications Society, Association of Public Policy Analysis and Management, Telecommunications Policy Research Conference, Western Communications Forum, Eastern Communication Forum*

Reviewer/Referee: *Strategic Management Review,* Jour*nal of Economics; Industrial and Corporate Change; Journal of Asian Economics; Journal of Economics and Business; Journal of Public Policy Analysis & Management; Journal of Regulatory Economics; National Science Foundation; Quarterly Review of Economics and Business; Review of Economics and Statistics; Telecommunications Policy*.

Government Service

Member, Governor's Ad Hoc Committee, Golden State Quality Awards

Member, Governor’s Task Force on Telecommunications Infrastructure for California Schools and Libraries

Pro bono consultation to California Department of Consumer Affairs, California Attorney General, National Association of State Attorneys General

Vita: Dr. Robert G. Harris

ADDENDUM F: PUBLICATIONS

"The Emergence of Competition in Local Exchange Service," with Lori S. Lent, invited paper, International Engineering Consortium, *Annual Review of Communications*, 1995-96 edition.

"Competition and Public Policies in Telecommunications: A Survey of U.S. Developments," presented to Conference on Privatization and Deregulation in the US, UK and Japan, Economic Research Institute of the Economic Planning Agency of Japan, Tokyo, 1995; *Conference Proceedings*.

"ISDN in the United States: Strategies for Success: Part II - The Deployment and Adoption of ISDN," with Luis A. Enriquez, *New Telecom Quarterly*, 1995. Reprinted in *Blue Sky: New Horizons in Telecommunications.*

"ISDN in the United States: Strategies for Success: Part I - The Diffusion of ISDN," with Luis A. Enriquez, *New Telecom Quarterly*, 1994. Reprinted in *Blue Sky: New Horizons in Telecommunications.*

"Competition and Unbundling in Local Telecommunications: Implications for Antitrust Policy," with Gregory L. Rosston and David J. Teece, presented to Telecommunications Policy Research Conference, Solomons, Maryland, October 1994; *Conference Proceedings,* EAL Press.

"State Regulatory Policies and the Telecommunications/Information Infrastructure," presented to Workshop of the National Research Council, Washington D.C., October 1993; *The Changing Nature of Telecommunications/Information Infrastructure*, National Academy Press, 1995.

"Access and Competition Policy in the Deregulated Rail Freight Industry,**{**PRIVATE **}** with Comparisons to Competitive Access Issues in Telecommunications," with Curtis M. Grimm, presented to Columbia Institute for Telecommunications and Informatics, New York, November 1993; *Conference Proceedings*, Oxford University Press.

"R&D Expenditures by the Bell Operating Companies: A Comparative Assessment," invited paper, Twenty-Third Annual Conference, Michigan State University Institute of Public Utilities, Williamsburg, Virginia, December 9, 1991; *MSU Public Utility Conference Proceedings*, 1993.

"Strategic Uses of Regulation: The Case of Line-of-Business Restrictions in Communications," with Robert A. Blau, presented to Academy of Management, Miami, FL, August 14, 1991; *Research in Corporate Social Performance and Policy*, James E. Post (ed.), JAI Press, 1992.

"Structural Adjustment through Industry Deregulation: The U.S. Experience in Telecommunications and Transportation," invited paper, Pacific Economic Cooperation Conference on Structural Adjustment, Kyoto, Japan, October 11, 1990; *PECC Conference Proceedings,* 1991.

Vita: Dr. Robert G. Harris

"Gaining Competitive Advantage through Strategic Public Policies: The Case of Japanese Telecommunications," invited lecture, National Economists Club, Washington, D.C., June 1988; *Economics and the Public Interest*, Richard T. Gill (ed.), Mayfield Publishing: Mountain View, CA, 1991.

"The Political Economy of Regulation: Analysis of Market Failures and Regulatory Responses," with James A. Carman, *Scaling the Corporate Wall: Readings in Social Issues of the Nineties*, S. Prakash Sethi, Paul Steidlmeier and Cecilia M. Falbe (eds.); Prentice-Hall: Englewood Cliffs, 1991.

"Telecommunications Services as a Strategic Industry: Implications for United States Policy," *Competition and the Regulation of Utilities*, Michael A. Crew (ed.), Kluwer Academic Publishers: Boston, 1990.

"Telecommunications as a Strategic Industry: Is There a Threat?" *Powernomics: Economics and Strategy After the Cold War*, Clyde V. Prestowitz, Jr., Ronald Morse and Alan Tonelson (eds.), University Press of America, 11. Reprinted from *Vital Speeches of the Day* LV(12), April 1989. Invited lecture, New York University Symposium on Telecommunications and Economic Development, December 1988.

"New Plans for Joint Ventures," with David C. Mowery, *The American Enterprise,* Sept/Oct 1990.

"Strategies for Innovation: An Overview," with David C. Mowery, *California Management Review* 32(3), Spring 1990, Co-Editor of Special Issue, "Strategies for Innovation."

"The Implications of Divestiture and Regulatory Policies for Research, Development and Innovation in the U.S. Telecommunications Industry," presented to Telecommunications Policy Research Conference, September 1988; *Telecommunications Policy*, April 1990.

"Telecommunications Policies in Japan: Lessons for the U.S.," presented to Advanced Workshop in Regulation and Public Utility Economics, Monterey, CA, July 1988; presented to Telecommunications Policy Research Conference, October 1988; *California Management Review* 31(3), Spring 1989.

"California Telecommunications Policy for the Twenty-First Century," *Report to the California Economic Development Corporation*, Sacramento, June 1988.

"A Qualitative Choice Analysis of Rail Routings: Implications for Vertical Foreclosure and Competition Policy," with Curtis A. Grimm, *The Logistics & Transportation Review*, March 1988.

"Horizontal Merger Policy: Promoting Competition and American Competitiveness," with Lawrence A. Sullivan, *Antitrust Bulletin*, January 1987.

"The Political Economy of Regulation," with James M. Carman, *Business & Society*, S.P. Sethi and C. Falbe (eds.), Lexington Books: Lexington, 1987.

Vita: Dr. Robert G. Harris

"Public Regulation of Market Activity: Regulatory Failures," with James M. Carman, *Journal of Macromarketing*, Spring 1986.

"The Effects of Railroad Mergers on Industry Productivity and Performance," with Curtis M. Grimm, invited paper, Transportation Research Board, National Academy of Engineering, January 1986; *Transportation Research Record* 1029, 1986.

"Revitalization of the U.S. Freight Industry: An Organizational Perspective," with Curtis M. Grimm, *International Railway Economics*, K. Button & D. Pitfield (eds.); Crower: London, 1985.

"The Values of Economic Theory in Management Education," *The American Economic Association Papers & Proceedings* 74(2), May 1984.

"Public Regulation of Market Activity: Regulatory Responses," with James M. Carman, *Journal of Macromarketing*, Spring 1984.

"Antitrust Market Definition: An Integrated Approach," with Thomas M. Jorde, *California Law Review* 72(1), January 1984. Reprinted in *Corporate Counsel's Annual*, Matthew Bender, 1985. Reprinted in *Antitrust Anthology*, A.I. Gavil (ed.), Anderson Publishing, 1995.

"Structural Economics of the U.S. Rail Freight Industry: Concepts, Evidence and Merger Policy Implications," with Curtis M. Grimm, *Transportation Research* 17A(4), July 1983.

"Vertical Foreclosure in the Rail Freight Industry: Economic Analysis and Public Policy Prescriptions," with Curtis M. Grimm, *ICC Practioners' Journal*, July 1983.

"Market Definition in the Merger Guidelines: Implications for Antitrust Enforcement," with Thomas M. Jorde, *California Law Review* 71(3), March 1983. Reprinted in *Antitrust Policy in Transition: The Convergence in Law and Economics,* Fox and Halverson (eds.), American Bar Association, 1984.

"Public Regulation of Market Activity: Institutional Typologies of Market Failures," with James M. Carman, *Journal of Macromarketing,* Spring 1983.

"Potential Benefits of Rail Mergers: An Econometric Analysis of Network Effects on Service Quality," with Clifford Winston, *Review of Economics and Statistics* 65(1), February 1983.

"Regulation: A Long Term Perspective," *Business Environment/Public Policy: The Field and Its Future*, Edwin M. Epstein and Lee E. Preston (eds.), St. Louis, 1982.

"The Financial Performance and Prospects of Railroads in the South and Southwest," with Curtis M. Grimm, *Texas Business Review,* November/December 1982.

"More on Passing On: A Reply to Cooter and to Viton and Winston," with Lawrence A. Sullivan, *Pennsylvania Law Review* 129(6), June 1981.

Vita: Dr. Robert G. Harris

Rationalizing the Rail Freight System: Costs and Benefits of Branch Line Abandonments, U.S. Department of Transportation, Washington, D.C., 1981.

"Determinants of Railroad Profitability: An Econometric Study," with Theodore E. Keeler, *Economic Regulation: Essays in Honor of James R. Nelson,* William G. Shepherd and Kenneth D. Boyer (eds.), Michigan State University Press, 1981.

"Passing on the Monopoly Overcharge: A Response to Landes and Posner," with Lawrence A. Sullivan, *Pennsylvania Law Review* 128(5), May 1980.

"Suppliers of Last Resort: Economics of Self-Supply in Common Carrier Industries," with Robert A. Meyer, *Quarterly Review of Economics and Business* 19(4), Winter 1980.

"Economic Analysis of Light Density Rail Lines," *The Logistics and Transportation Review* 16(1), Winter 1980.

"Passing on the Monopoly Overcharge: A Comprehensive Policy Analysis," with Lawrence A. Sullivan, *Pennsylvania Law Review* 128(2), December 1979.

"Rationalizing the Physical Structure of the U.S. Rail Freight Industry," *National Railroad Policy,* Joint Economic Committee, U.S. Congress, Washington, D.C., Government Printing Office, 1979.

"Simple Analytics of Rail Costs and Disinvestment Criteria," *Transportation Research Record* 687, 1978.

"Economics of Traffic Density in the Rail Freight Industry," *Bell Journal of Economics* 8(2), Autumn 1977.

Vita: Dr. Robert G. Harris

ADDENDUM G: SEMINARS, SPEECHES & PRESENTATIONS

“Principles of Imputation, Costing and Pricing of Interconnection and Essential Facilities,” Sub-Secretariat of Telecommunications, Government of Mexico (with Dr. Richard Emmerson), August 22, 1995.

"Telecommunications Trade and Investment Opportunities in China and India," presented to the Massachusetts Telecommunications Council, Boston, February 1995.

"The Strategic Implications of Interactive Broadband Telecommunications Networks for Competition and Public Policy," presented to the National Communications Forum, Chicago, September 1994.

"Competitive Implications of Vertical Relations between Equipment Vendors and Telecommunications Services: Lessons from the French Experience," with Joanne Oxley, presented to European Regional Conference of the International Telecommunications Society, Stenungsbaden, Sweden, June 21, 1993.

"Obtaining Competitive Intelligence and Creating Competitive Advantage through the Public Policy Process," with Steven Harris, invited paper, Annual Conference of the Society for Competitive Intelligence Professionals, Los Angeles, April 2, 1993.

"Deployment and Adoption of Integrated Services Digital Network in the U.S.: Progress and Public Policy Obstacles," with Luis Enriquez, invited paper, Twenty-Fourth Annual Conference, Michigan State University Institute of Public Utilities, Williamsburg, Virginia, December 8, 1992.

"Market Definition and Market Power in the Sports and Entertainment Industry," invited presentation, Antitrust Section, American Bar Association Annual Proceedings, San Francisco, August 1992.

"The Design of Incentive Regulation for Telecommunications," invited presentation, Conference on Alternative Regulation, Illinois Commerce Commission, Chicago, July 1992.

"The Effects of Public Policies on ISDN Deployment and Adoption in the U.S.," presented to International Telecommunications Society, Cannes, France, June 1992.

"Removing the MFJ Restriction on InterLATA Services," invited testimony, Subcommittee on Telecommunications & Finance, U.S. House of Representatives, Washington D.C., May 1992.

"The Implications of Telecommunications Infrastructure Investment for R&D, Innovation and Competitiveness," invited testimony, Subcommittee on Communications, U.S. Senate, Washington D.C., February 1992.

"Principles of Costing and Pricing for Telecommunications Regulatory Policy," invited testimony, Colorado Public Utilities Commission En Banc Hearing, Denver, February 1992.

Vita: Dr. Robert G. Harris

"Deregulation and Interstate Bank Entry in California," with Lee Burke, Research Report of the California Policy Seminar, UC Berkeley, April 1991.

"Assessing the Future of Telecommunications in the Global Economy," invited address, California Telephone Association, Monterey, CA, February 1991.

"Economic Rationale for a National Fiber Optic Infrastructure," invited address, Congressional Staff Forum on Telecommunications (sponsored by Ameritech), Washington D.C., February 1991.

"Applications of Incentive Regulation: An International Comparison," invited presentation, Conference of California Public Utilities Counsel, Long Beach, CA, October 1990.

"The Role of Telecommunications in Regional Economic Development," invited address, Rocky Mountain State Leaders Conference, Billings, Montana, October 1990.

"Telecommunications and Public Policies in the Global Market," invited address, Carnegie Council, New York, NY, October 1990.

"Why We Need a National Telecommunications Policy: A Comparative Perspective," invited address, Policy Issues Management Conference, Bell Communications Research, Murray Hill, NJ, October 1990.

"Incentive Regulation for Telephone Utilities," invited presentation, Workshop of the Colorado Public Utilities Commission, Denver, September 1990.

"The Role of Telecommunications Policy," invited lecture, Conference on Economic Development in the Pacific Northwest, Portland, Oregon, September 1990.

"The Changing Economics of Telecommunications: Implications for U.S. Policy and Competitiveness," invited briefing of U.S. Congressional staff on telecommunications (sponsored by Pacific Telesis), San Francisco, August 1990.

"Communications Competitiveness and Infrastructure Modernization Act of 1990," invited testimony, Communications Subcommittee, U. S. Senate, Washington D.C., July 1990.

"Investing in America's Future," invited essay, 1989 Annual Report of Southwestern Bell Corporation, St. Louis, 1990.

"The Public Switched Telephone Network and Rural Economic Development," invited lecture, Montana State Leaders' Conference, Helena, April 1990.

"Is Public Policy Meeting the Needs of Consumers?" invited panelist, Conference on Telecommunications Technologies and Policies, Center for Communications and Information Science & Policy, University of Pennsylvania, March 1990.

"Telecommunications as a Strategic Industry," invited address, New England Council, Boston, February 1990.

Vita: Dr. Robert G. Harris

"Fiber to the Customer: A Public Policy Perspective," invited paper, Western Communications Forum, San Diego, February 1990.

Session Chair and Moderator, "State Regulatory Reform: Recent and Future Trends," Fifth Conference on State Telecommunications Regulation, University of Utah, Salt Lake City, January 1990.

Invited Panelist, "Crossroads of Information Technology," Board on Telecommunications and Computer Applications, National Academy of Engineering, Washington D.C., October 1989.

Invited Panelist, "Industry Forum," Annual Meeting of the U.S. Telephone Association, San Francisco, October 1989.

"Strategic Lessons from Deregulated Industries," paper presented to Strategic Management Society, San Francisco, October 1989.

"Deregulation in the Transportation Industries: Lessons for Telecommunications Managers," invited paper, Center for Telecommunications Management, University of Southern California, October 1989.

"Price Cap Regulation and Economic Forecasting," invited presentation to 1989 National Forecasting Conference, Bell Communications Research, San Francisco, May 1989.

"The Strategic Implications of Telecommunications Deregulation in Europe," invited presentation, Strategic Management Society, Amsterdam, October 1988.

"Telecommunications Deregulation: Implications for the California Economy," invited presentation, California Foundation for the Environment and the Economy, Carmel, June 1988.

"A Comparison of U.S. and Japanese Policies toward Information Technologies," invited presentation, International Public Economics Association, Tokyo, May 1988.

"Information Technologies, Public Policy, and Regional Economic Development," invited address, Conference on Regional Development in Japan, Hokkaido University, Sapporo, Japan, May 1988.

"The Implications of Line-of-Business Regulation for Diversification Strategy & Enterprise Structure," presented to Strategic Management Society, Boston, October 1987.

"Alternative Regulatory Frameworks for Local Exchange Carriers," invited presentation, En Banc Hearing of the California Public Utility Commission, September 1987.

"Emerging Telecommunications Policies in Europe," Briefing of California Legislative Leaders, Los Angeles, September 1987.

Vita: Dr. Robert G. Harris

"Japanese Corporate Philanthropy in the United States," presented to Academy of Management, New Orleans, August 1987; Center for Research in Management Working Paper BPP-23; published in summary form in *Strategic Directions*, with Barbara Lombardo and David Vogel, April 1989.

"The Effects of Deregulation on Competition and Competition Policy in Banking: A Review of the Literature," Working Paper No. 4, National Center for Financial Services, Berkeley, August 1987.

"Competitive Strategies under Regulatory Constraint: Implications of the AT&T Divestiture on Vertical Relations in Telecommunications," with David J. Teece, paper presented to Strategic Management Society, Singapore, 1986.

"The Economic Consequences of Deregulation," invited address, Emerging Issues Program, Conference of National State Legislative Leaders, Los Angeles, September 1986.

"Public Policies toward Utility Diversification: An Overview," invited presentation, California Policy Seminar/California Senate Office of Research, Berkeley, April 1986.

"New Technologies for Local Loop Access: An Economic and Regulatory Analysis," with Gary Pisano, Office of Technology Assessment, United States Congress, June 1985.

"Corporate Community Involvement in the Greater San Francisco Bay Area," with D. Vogel and J. Logsdon, Center for Research in Management, working paper, Berkeley, May 1985.

"The Future of Telecommunications Regulation," invited presentation, En Banc Hearing of the California Public Utilities Commission, San Francisco, November 1984.

"Testimony in Support of the Taxpayer Antitrust Enforcement Act," Judiciary Committee, U.S. Senate, May 1984.

REPLY DECLARATION OF PROFESSOR ROBERT G. HARRIS

ATTACHMENT 2

DSL BUSINESS CASE ANALYSIS

July 17, 2002

TABLE OF CONTENTS

1. PURPOSE OF THE DSL BUSINESS CASE ANALYSIS

The continued development of the high-speed Internet market depends critically upon upgrades to existing networks and the creation of new networks. To accomplish this, private firms must be willing to make substantial high-risk investments in an environment of technological and competitive uncertainty.

Digital subscriber line (DSL) network investments are designed to provide services in a competitive market, and investments in competitive markets carry substantial amounts of risk. The inherent balance between risks and rewards fuels innovation and investment in our free market economy. The possibility of over-regulation adds an additional layer of risk to DSL investment decisions, while adding no offsetting layer of reward. This over-regulation will disrupt the market forces that we depend upon to achieve beneficial levels of innovation and investment.

Increasing the risks and uncertainties associated with making investments decreases incentives to invest. This maxim is especially true of large-scale investments in durable assets, such as investments to extend DSL capabilities into wireline networks. The purpose of our DSL business case analysis is to provide a quantitative assessment of the inherent riskiness of DSL investments and to show how regulatory restrictions can turn an otherwise positive DSL business case negative.

Private firms develop business case analyses to decide whether or not they should make an investment. If the business case does not show enough cash flow to cover the capital invested, plus a return equal to or exceeding the cost of capital, the firm will not, and should not, make the investment. Hence, regulatory risk that turns the DSL business case negative would have the effect of denying DSL service to the remaining households whose lines have not yet been upgraded, as the firms could not justify further build-out.

The business case model shows that DSL is a risky investment. The baseline view, assuming all goes according to plan, yields sufficient returns to justify the risky investment. Market risk, such as lower penetration of DSL resulting from technological challenges or heavier than expected competition, drives the business case down to just above breakeven. Regulatory risk, on the other hand, drives the business case negative, implying that the regional Bell operating companies (RBOCs) should not invest in upgrading their networks for DSL if they are going to be forced to unbundle the service at artificially low unbundled network element platform (UNE-P) prices.

This asymmetric regulatory risk puts DSL at a big disadvantage relative to cable modems, satellite, wireless, and other broadband providers, who are not required to unbundle their services. If policy-makers want to encourage facilities-based broadband competition through faster and broader deployment of DSL, they need to focus on leveling the playing field for all broadband providers by removing the asymmetric regulatory risk that discourages investment in DSL.

2. OVERVIEW OF THE DSL BUSINESS CASE ANALYSIS

Incumbent local exchange carriers (ILECs) have made and continue to make substantial investments to extend the DSL capabilities of their networks to end user customer locations. These investments are made with the expectation that they will generate sufficient cash flows over several years to recover the costs, including the cost of capital, associated with these substantial investments. There are, however, considerable risks to this expectation.

Our DSL business case analysis uses a simplified cash flow model designed to illustrate the risks associated with RBOC investments in DSL capabilities. It is an aggregate model based upon reasonable assumptions for the financial performance of RBOCs as a group, but it is not a projection of the actual cash flows that any individual RBOC might experience. Many of the input values for our analysis are projections made by Lehman Brothers in reports on the future of DSL.[1] We supplemented these data with information from multiple sources including RBOC public filings, other industry analyst reports, and discussions with BellSouth financial directors and BellSouth network engineers. Consistent with the financial expectations driving DSL investments, the baseline run of this model projects annual cash flows sufficient for the RBOCs to recover their DSL investments and expenses.

There are many forms of market risk inherent in providing DSL service that could have a major effect on the financial viability of the DSL business case. These include the rate of adoption of broadband services in general, DSL service in particular, and wireless technologies; increased churn and customer acquisition costs; and DSL deployment costs. In the first scenario, we assess one form of market risk—showing the effect of 25 percent fewer DSL subscribers than the baseline view. The analysis shows that lower market penetration would jeopardize an otherwise positive DSL business case.

In addition to normal market risks, the DSL business case is subject to risks resulting from regulation. While some of the normal market uncertainties have upside as well as downside, regulatory risk has only downside potential. In the second scenario, we assess the effect of requiring the RBOCs to unbundle DSL service and allow the resale of DSL service at UNE prices (a DSL version of UNE-P). We show that these regulatory requirements would seriously jeopardize the abilities of the RBOCs to recover their DSL investments, thereby discouraging investment.

Like all business cases, this analysis does not incorporate every conceivable factor. This analysis leaves out some of the benefits and costs of DSL deployment that accrue to other RBOC lines of business. Benefits include protecting core voice revenues by building customer loyalty with attractive bundles of services that compete with cable company offerings. Furthermore, the network upgrades give the RBOCs a head-start on the next generation of higher-bandwidth broadband services. Upgrading the network may also lower some maintenance costs.

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[1] Lehman Brothers, "Wireline Services, Industry Update, Scaling DSL – RBOCs Poised to Mine Returns in '02/'03," June 7, 2001; Lehman Brothers Cable Communications Services, "Consumer Broadband – Cable vs. DSL Chapter 2," June 7, 2001.

On the other hand, DSL deployment brings a number of additional costs not captured in the business case. For instance, about 30% of new DSL subscribers give up a second phone line.[2] Unbundling requirements could substantially raise the network upgrade cost: competitive local exchange carrier (CLEC) line card collocation could strand capacity in remote terminal (RT) locations, and CLECs offering constant bit rate quality of service could require the RBOCs to spend more capital to increase bandwidth availability.[3] No business case is fully comprehensive; more detail could always be included. Nevertheless, conducting a standalone business case analysis, such as the Lehman Brothers report, is a customary and proper way to understand the bottom-line impact of a new service like DSL.

3. BASELINE VIEW

Baseline RBOC cash flows related to DSL services have been projected through year 2011. In the baseline, annual cash flows turn positive in year 2004, and by 2010 the cumulative discounted cash flows are positive. A positive value for the cumulative discounted cash flows reflects the expectation that DSL investments will create value for the RBOCs.

"Free cash flow" is a measure of the cash generated (revenues) by a business venture less the cash paid (investments and expenses) to undertake the venture. In a business case analysis, a firm projects the key drivers of annual cash flows and sums the discounted annual cash flows to determine if the business venture makes financial sense, i.e., creates value. A venture creates value for its owners to the extent that it generates cash sufficient to recover the investments and expenses and compensate the owners for the use of their money. When cash flows occur over a number of years, a proper evaluation must take into account the time value of money. This is done with a process called discounting. Discounted cash flows are annual flows that account for the time value of money.

For large network investments it is typical to experience relatively large negative cash flows for a number of years, with the expectation of positive cash flows in later years. This is the expectation in the baseline view.

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[2] "Digital subscriber lines (DSL) allow customers to talk and use the Internet at the same time. About 30% of DSL subscribers dump their second phone lines after getting DSL, says Steve Davis, an executive with Qwest Communications." From "Consumers Hang Up Residential Phone Lines – Spending Cutbacks, Multi-Use Net Links, Cellphones Cited," USA Today, August 2, 2001, p. B1.

[3] See In the Matter of Review of the Section 251 Unbundling Obligations of Incumbent Local Exchange Carriers, Implementation of the Local Competition Provisions in the Telecommunications Act of 1996, Deployment of Wireline Services Offering Advanced Telecommunications Capability, CC Docket No. 01-338, 96-98, 98-147, Federal Communications Commission, Comments of SBC Communications, Inc., April 5, 2002, Attachment C for more details.

For the years 2000-2005, many of the input values for the baseline view were extracted from the Lehman Brothers report on DSL. Other sources of information included RBOC public filings, other industry analyst reports and discussions with BellSouth financial directors and BellSouth network engineers. To illustrate RBOC risks associated with DSL investments, it is useful to extend the Lehman Brothers view through 2011. Figure 1 lists some of the key input values in the baseline view.

Figure 1: Key Input Values of Baseline View

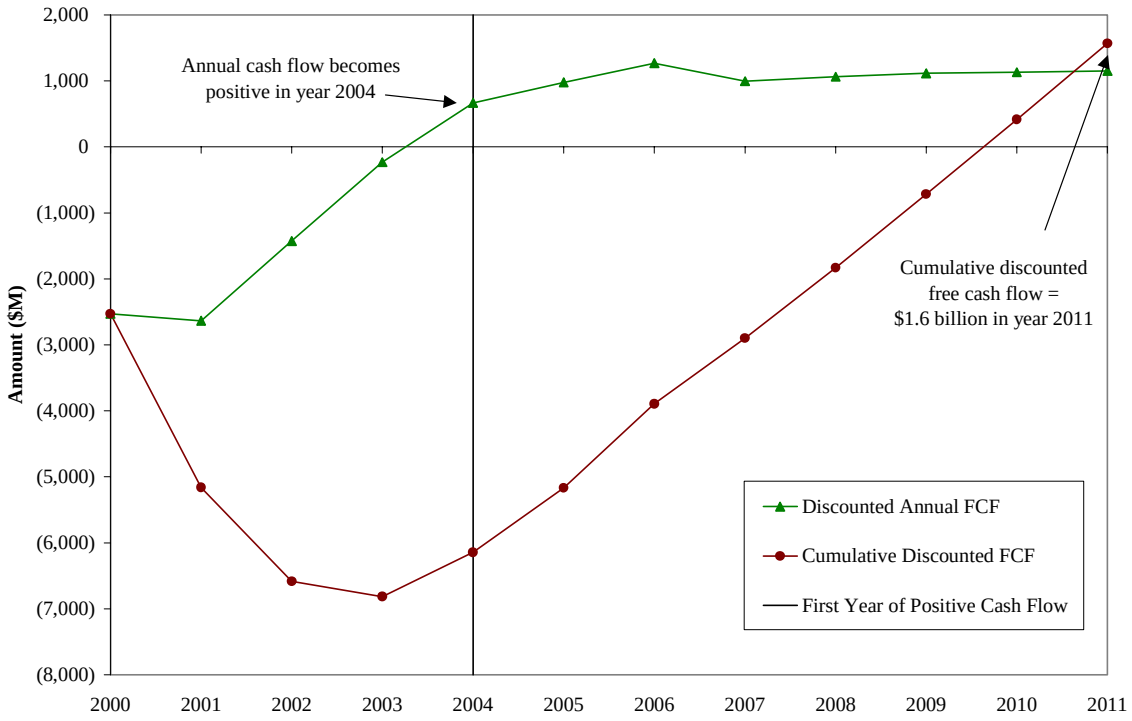
	2002	2004	2006	2008	2010
Subscribers (M)	6.7	12.4	16.5	20.1	24.0
Revenues ($B)	3.1	6.6	9.4	11.6	13.9
Non-Depr Expenses ($B)	2.9	4.0	4.7	5.4	6.1
EBITDA ($B)	0.2	2.6	4.7	6.1	7.7
Capital Spending ($B)	2.4	0.7	0.5	1.3	1.3
Cum. Cap Spending ($B)	7.3	9.6	10.7	13.2	15.7

Subscriber growth is based on Lehman Brothers projections. In 2002, Lehman Brothers projects 6.7 million DSL subscribers for the RBOCs. This is 35 percent of the combined projected cable modem and RBOC DSL subscribers. DSL subscribers are projected to grow 16 percent per year to 25.5 million subscribers in 2011.

In the baseline, average revenue per line rises from approximately $48 in 2002 to $50 by year 2005 and remains constant thereafter. Average revenue per line is a composite of expected revenues per line from retail residential customers, retail business customers, and wholesale customers.

Baseline projections of annual discounted cash flows and cumulative discounted cash flows are shown in Figure 2. As shown, annual cash flows turn positive in year 2004 of the baseline view, and by 2011 cumulative discounted cash flows equal $1.6 billion.

Figure 2: Baseline View: Cash Flow Positive in 2004 ($1.6 Billion Value in 2011)



Due to a total of almost $9 billion of capital spending from years 2000 to 2003, free cash flow is negative in each of these years, and the RBOCs are in a $7 billion financial hole. After 2004, DSL capital spending drops significantly and annual cash flows turn positive. After six years of positive cash flows, the investment is essentially recovered, and by year 2011, the cumulative discounted value of the DSL cash flows is $1.6 billion.

4. ADDITIONAL RISKS BEYOND THE BASELINE VIEW

There are many market and regulatory risks to the baseline view. Our analysis examines two significant risks, one inherent in the competitive process and one stemming from the regulatory process. Potential impacts associated with our risk analyses are shown relative to the baseline view. These impacts are described by comparing the cumulative discounted free cash flows in 2011.

Market Risk: Lower Penetration of DSL

Inherent in the baseline view are many business risks and uncertainties. Key uncertainties that affect the financial viability of DSL service include:

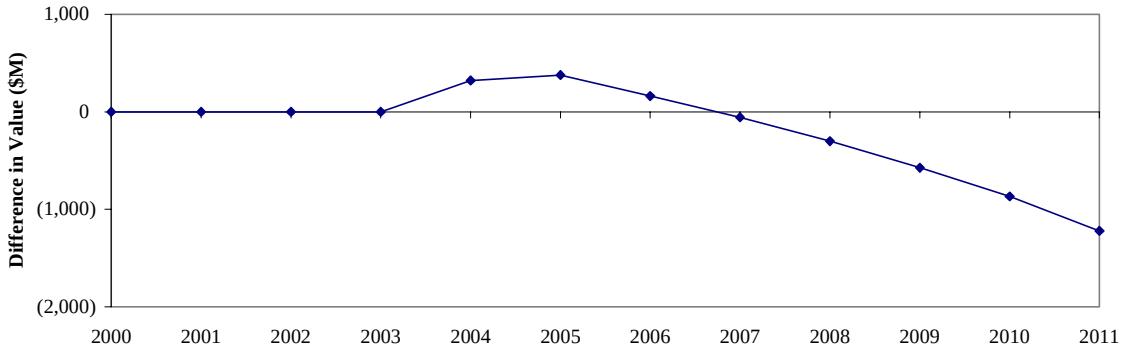
- size of broadband service market,
- DSL market share,

- rate of deployment and adoption of alternative technologies such as mobile and fixed wireless and satellite services,
- rate of obsolescence of current DSL technologies,
- competitive price pressure,
- incremental capital costs,
- customer acquisition costs and customer churn, and
- customer service costs.

While many of these uncertainties have some upside potential, given the highly competitive nature of the broadband services market, the downside potential is enormous. In this scenario, we examine the effect of lower market penetration of DSL, which could be caused by a number of factors including lower than projected broadband adoption, higher than projected use of alternative technologies, or faster adoption of services that deliver broadband speeds higher than DSL capability.

The baseline view projects 25.5 million DSL subscribers in 2011. In this scenario, we reduce DSL subscribers by 25 percent. The impact of fewer subscribers on cumulative free cash flow is shown in Figure 3. The major difference from the baseline is that the cumulative discounted cash flows are approximately $1.2 billion less than the baseline view by 2011.[4] That winning fewer subscribers presents a serious threat to the financial success of DSL investments demonstrates the high degree of inherent risk in the DSL business.

Figure 3: Lower DSL Market Penetration Reduces Value by $1.2 Billion (Relative to Baseline)



[4] For a short period, the cumulative cash flows are higher as less investment is required for incremental capital, due to the smaller number of subscribers.

Regulatory Risk: UNE-P Pricing of DSL

As noted above, average revenue per DSL subscriber is a composite of expected revenues per line from retail residential and business customers and from wholesale customers. Average wholesale revenues per subscriber are $12 lower than average retail residential revenues, which reflect costs not incurred by RBOCs, such as customer care and Internet Service Provider (ISP) costs, when another firm is the provider of service to the end user. The availability of wholesale services at prices that reflect RBOC actual costs allows competitive entry while compensating the RBOCs for the investments and operating expenses required to provide DSL service.

Our risk analysis examines the impact of a regulatory requirement that would force the RBOCs to provide DSL service at steep discounts based upon estimates of total element long run incremental costs (TELRIC). This would create, in effect, a UNE-P for DSL service. We assume that the UNE-P price for DSL would be 40% below the retail rate for DSL. Although a 40% discount would be very bad public policy, it is unfortunately typical of UNE-P discounts currently being used for traditional voice services, according to several sources.[5] For example, an extensive state-by-state survey of UNE-P prices by Commerce Capital Markets found that the UNE-P "discount from average revenue ranges between 38% and 61%."[6] It is bad enough that UNE-P discounts are so high that prices are often well below real economic costs for voice services. UNE-P pricing of DSL facilities would further compound the problem and greatly harm incentives for investment in broadband infrastructure.

Moreover, while the substantial drop in revenues alone would have a significant negative impact on the financial viability of DSL investments, this is not the only harmful effect of UNE-P pricing of DSL. Impacts from lower wholesale prices would increase the portion of subscribers served by providers that resell RBOC services and/or force significantly lower prices for RBOC retail customers. To illustrate these impacts, the portion of wholesale lines is increased from 25 to 50 percent in this business case scenario.

Figure 4 shows the effect of the reduction in average revenue and increase in wholesale subscribers. Realization of the downside risk associated with a UNE-P DSL offering would drive cumulative cash flows downward by $2.5 billion and seriously impair the abilities of the RBOCs to recover their DSL investments. This scenario is conservative in its assessment of cash flow loss, as it does not include any additional costs resulting from unbundling.

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[5] Michael Armstrong, Chairman and CEO of AT&T, has lauded the high margins and returns that competitors can achieve when they get discounts of 40% or more on a UNE-P platform. See, for instance, the transcript from the AT&T/Comcast analyst meeting on December 20, 2001; see also Armstrong's keynote speech from a UBS Warburg Global Telecom Conference, as reported in Telecommunications Daily, November 14, 2001.

[6] Commerce Capital Markets, "Status and Implications of UNE-Platform in Regional Bell Markets," November 12, 2001, p. 6.

Figure 4: UNE-P Pricing of DSL Reduces Free Cash Flow by $2.5 Billion (Relative to Baseline)

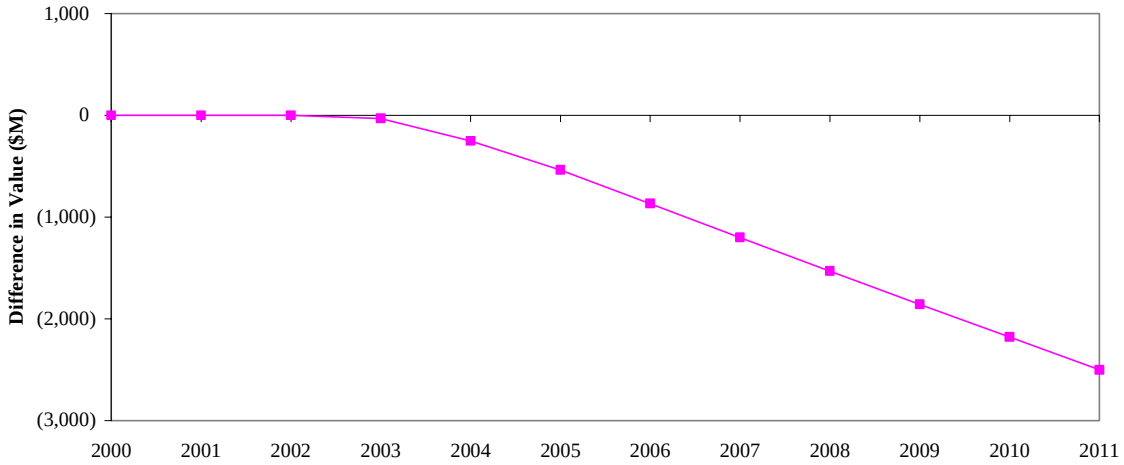

Figure 5 shows the shareholder value impact of this reduction in free cash flow. Stock market analysts commonly express the value of a firm (market capitalization or "market cap") as a multiple of its annual free cash flow, because the value of a firm to its shareholders is strongly related to its current and future ability to generate cash. Lower cash flows lead to lower valuations. Note that this valuation approach uses a single year of undiscounted cash flow, times a fixed cash flow multiple.[7] The cash flow multiple incorporates the anticipated growth rate of cash flow as well as the discount rate.[8]

Relative to the baseline view, the UNE-P scenario generates $700 million less in cash flow in 2006, and $1.3 billion less in 2011, resulting from the increased penetration of wholesale lines and substantially lower revenue per wholesale line. Using a standard cash flow multiple for the RBOCs, the free cash flow loss from UNE-P pricing would amount to a valuation loss of approximately $9 billion of the total RBOC market cap by 2006, and $15 billion of the total RBOC market cap by 2011. These figures correspond to 3% and 5%, respectively, of the current total RBOC market cap, which is a highly significant loss in valuation.

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[7] In comparing Figures 4 and 5, the $2.5 billion in Figure 4 is the difference in cumulative discounted cash flows from 2000 to 2011, whereas the $1.3 billion in Figure 5 is the difference in the undiscounted cash flow in 2011.

[8] The cash flow multiple used by analysts in valuation depends on many factors, including the anticipated growth rate of the cash flows. Figure 5 looks only at the first-order impact of cash flow losses on valuation, and does not account for any additional loss in valuation due to a lowering of the multiple.

Figure 5: UNE-P Pricing of DSL Reduces Market Capitalization by 5% by 2011

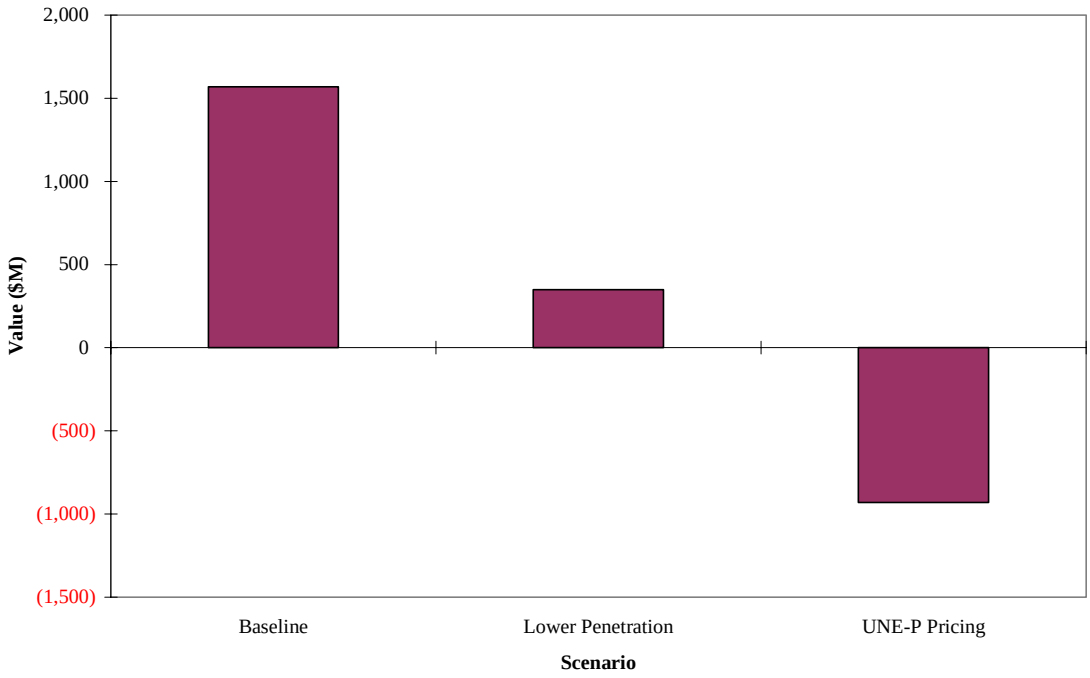
Figures in $M	2006	2011
Baseline Scenario Annual FCF	2,812	4,493
UNE-P Scenario Annual FCF	2,080	3,240
Difference in FCF	732	1,254
12x Multiple (Market Cap Loss) [1]	8,782	15,043
Current Total RBOC Market Cap [2]	300,800	300,800
% Loss in Market Cap	2.9%	5.0%

Notes
[1] 12x FCF Multiple used by Dresdner Kleinwort Wasserstein report (3/8/02, Fig. 37) to analyze UNE impact on shareholder value.
[2] Total market capitalization of Bell South, SBC, Verizon, and Qwest, as reported by Yahoo! Finance, 4/12/02.

Summary of Risk Scenarios

Figure 6 summarizes the value of the DSL business case in the baseline view and the two risk scenarios. The difference between the baseline view and the lower DSL market penetration scenario demonstrates the inherent risk in the DSL business. The UNE-P pricing regulatory scenario drives the business case value negative. In this scenario, it is highly unlikely that RBOC investment in DSL services would ever be recovered.

Figure 6: Regulatory Requirements Drive DSL Business Case Negative



5. SUMMARY AND CONCLUSION

There is no incumbent in the broadband Internet market for residential and small business customers, and DSL is not even the leading technology for providing this service. There is burgeoning competition in this market, with the promise of even greater competition from emerging technologies on the horizon. This is not a market in need of regulation, but it is a market in which that regulation can have serious negative impacts on the rate of investment, innovation and adoption of broadband technologies and services.

Even in the baseline view, the RBOCs are undertaking large-scale investments that they cannot expect to recover for many years. This will require monthly payments from residential and small business customers who will have an increasing array of choices for their broadband Internet connections. These facts alone are enough to highlight the high-risk nature of these investments. As shown above, if competitors using other technologies win greater shares of the broadband Internet market, RBOCs may not recoup their investments until well after the close of the decade. If the RBOCs are forced to offer a UNE-P version of DSL with prices below cost, it is all but certain that they will not remain viable players in the broadband Internet market.

Orange County, Florida
Zoning

ORANGE COUNTY GOVERNMENT
FLORIDA

- R-L-D
- Residential
- Residential Cluster
- University Residential
- Multi-Family R-2
- Multi-Family R-3
- Mobile Home Residential
- Professional Office
- Commercial
- Industrial
- Planned Development
- A - R
- A - 2
- A - 1

1 Inch = 3 Miles

0 3 Miles

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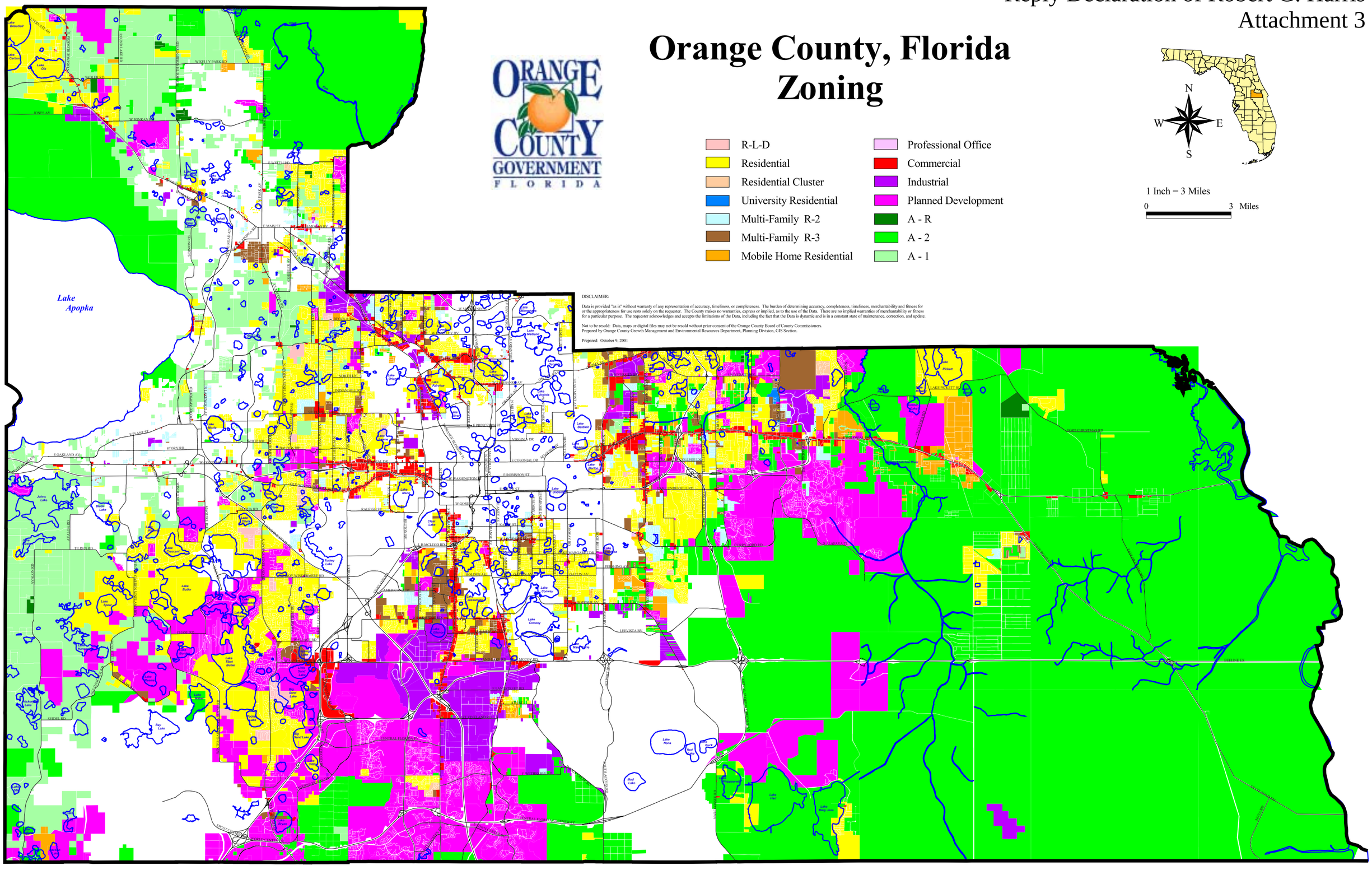
Prepared by Orange County Growth Management and Environmental Resources Department, Planning Division, GIS Section.

Prepared: October 9, 2001



ATTACHMENT 4: OECD BROADBAND & CABLE PENETRATION

Country	Rank (2000) [a]	Total Broadband Penetration per 100 Inhabitants(2000) [b]	% Households passed by cable (1999) [c]	Same Telecom/ Cable Co.? [d]
Korea	1	9.20	48	
Canada	2	4.54	93	
United States	3	2.25	96	
Sweden	4	1.86	65	√
Austria	5	1.70	53	
Netherlands	6	1.68	94	
Belgium	7	1.42	100	
Denmark	8	1.27	70	√
Iceland	9	0.70	..	√
Finland	10	0.58	63	√
Japan	11	0.50	..	
Switzerland	12	0.43	72	
Australia	13	0.39	34	√
Norway	14	0.34	47	
Germany	15	0.32	86	
France	16	0.31	32	
New Zealand	17	0.27	..	
Portugal	18	0.26	47	√
Italy	19	0.20	5	
Spain	20	0.15	8	
Czech Republic	21	0.10	..	
United Kingdom	22	0.09	51	
Hungary	23	0.03	66	
Mexico	24	0.02	32	
Ireland	25	0.01	50	
Greece	26	0.00	0	
Poland	28	0.00	..	
Luxembourg	NA	0.00	100	√
Slovak Republic	NA	0.00	..	
Turkey	NA	0.00	..	√
OECD		1.27		
EU		0.39		

[a] Information from OECD Oct 2001 Report, Table 4.

[b] Information from OECD Oct 2001 Report, Table 3. Includes cable, DSL and "other" broadband penetration.

[c] Information from OECD Oct 2001 Report, Table 2.

[d] Information from OECD Oct 2001 Report, Section: Broadband developments in OECD countries.

Notes:

1. In Finland, the cable networks are mainly owned by the regional incumbent phone companies (see http://hkkk.fi/mmedia/itp97/reports/report3.html#_Toc392388876).
2. The only two cable networks in Australia are owned by the two ILECs.
3. Norway's ILEC, Telenor, is the second largest cable provider.
4. Germany's Deutsche Telecom sold all its remaining cable properties in February 2001.
5. France Telecom, is also the second largest cable operator.
6. Telecom Italia partially owns the major cable company.
7. Turk Telecom owns the cable infrastructure and receives a percent of the cable companies' revenue.
8. Hungary's ILEC, Matav, owns the second largest cable company.

Source: "The Development of Broadband Access in OECD Countries," OECD, October 29, 2001.